THE

Practical Teacher

A MONTHLY EDUCATIONAL JOURNAL.

Edited by JOSEPH HUGHES.

'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

VOL. VIII. No. 7. SEPTEMBER, 1888. PRICE, 6D. POST FREE, 7½D.

Pestalozzi.

BY THE REV. CANON WARBURTON, M.A.,

Formerly Her Majesty's Inspector of Training Colleges for Schoolmistresses.

CHAPTER V.—*continued.*

Lessons in Language, Form, and Number.

Of his lessons in Language we have already learned something in former pages, but it is only fair to state the *theory on which he intended* language should be taught, though we may not be disposed to imitate his practice in all its details. The first step, he tells us, is to teach the child to distinguish articulate sounds and imitate them. The second is to teach him to name everything brought under his notice, in order to furnish him with a supply of words. The third is to teach him to distinguish and name the most striking parts, characteristics, and qualities of particular objects—to observe them with intelligence, and then express himself correctly in describing them. The fourth is to teach him to abstract, generalise, and classify in language. The fifth, and last, is to teach him to describe not only the qualities of objects, but their uses, combinations and relative values; and to assign them their several places in the social economy of the world. In this way the habit of viewing the material world with intelligence is excited and cultivated, and this is combined with the power of correct and ready expression. 'Language,' Pestalozzi observes, 'is the reflex of all the impressions which Nature's entire domain has made on the human race. Therefore I make use of it, and endeavour, by the guidance of its uttered sounds, to reproduce in the child the selfsame impressions which, in the human race, have occasioned and formed these sounds. Great is the gift of language! It gives to the child in one moment what Nature required thousands of years to give to man.' Compare these observations with the statement of Pestalozzi's opinions in p. 282, and mark how, in dealing with the relations of words and things, this profound but irresolute thinker fluctuated between the two great schools of thought which have divided the world since the days of Plato and Aristotle.

Secondly, with respect to Form. Pestalozzi invented a few of those simple mechanical appliances by which the eye and touch of babies are taught to distinguish between round and square, a process which we find thus magniloquently described: 'He learns the data of the science from the examination of geometrical solids.' Under the head of form he included writing, drawing, and geometry, holding that the basis of each of these requirements was the perception of shape and dimension. Drawing ought to be an universal accomplishment, because it leads the child from vague perceptions to clear ideas. The art of measuring must, however, precede that of drawing. 'If a child,' says he, 'is called upon to imitate objects before he has acquired a distinct notion of their proportions, his instructions in the art of drawing will fail to produce on his mental development the beneficial influence which alone makes it worth learning.' Then, again, writing, he contended, should be taught, not before, but after drawing, 'for writing is, in fact, a kind of linear drawing, and that of fixed forms, from which no arbitrary or fanciful deviations are permissible.'*

As to the method of imparting the last of the three Pestalozzian 'elements,' namely, Number, he thus writes himself: 'The rudiments of number should always be taught by submitting to the eye of the child certain objects representing the units. A child can conceive the idea of "two balls," "two roses," "two books," but it cannot conceive the idea of "two" in the abstract.' To this Dr. Mayo adds: 'When the child has been thus exercised in distinguishing and naming "one," "two," "three," the number of the different objects presented, he will soon have an intuitive perception that the terms "one," "two," "three "are always the same, while the objects, to which they are applied, vary; he will thus be prepared to separate the idea of number from that of the thing, and so ascend to the abstract idea. When he has a correct idea of the numbers up to ten, he is ready to carry on different combinations of these numbers. By practical examples, he learns to form rules for himself —he works his own way, acquiring power, vigour, and

* The principles of Pestalozzi's system of Geometrical instruction have been successfully and beautifully applied in 'The Lessons on Form' of Mr. Reiner, late of the Home and Colonial Training College.

readiness at each advance; he is not led hoodwinked through the intricacies of arithmetic, but understands what he is about, first becoming acquainted with elements, and then enjoying the pleasure of finding the results of their various combinations. The whole is a *reasonable* exercise.'

To conclude with a few words on the Pestalozzian method of teaching the elements of Latin, for which this seems to be the proper place. Dr. Mayo thus writes in one of the letters from which extracts have already been given: 'Pestalozzi does not begin with definitions, because children never comprehend them; but first, calling up the idea in the child's mind by conversing with him, he gives him the simple sentence "*leo est animal.*" Here the words *leo* and *animal*, being, one almost the same, the other quite the same as those which express the same ideas in English, they readily enter the child's mind. From this he proceeds to "*an ape is—what?*" "*an animal.*" "*Simia est—what?*," "*animal*," the child using the word he had learned just before. Proceeding in this manner he stocks the child's mind with words, before he enters on the inflexions of those words, always endeavouring to link what the child has to learn with what he has already acquired. In the declensions he does not propose to the child "*musa*, a Muse, *musæ*, of a Muse"—words which cannot interest the child, because they represent only parts of ideas—but he involves the important word in sentences, thus: "*rosa est flos amœnissimus horti*," "*rosæ odor est suavis*," &c., through all the cases. The child having learned the inflexion of *rosa*, has a similar word proposed to him, also enveloped in little sentences, but he is now required to find the terminations. The advantages of this method are briefly these: you do not disgust the child with his first intellectual exertions, you exercise other faculties besides memory, you enrich his mind with a great number of ideas, and you furnish him with a *copia verborum* before you set him down to translate a classical author, or to express his own ideas in a connected chain in the language.' The same writer thus contrasts the above with the ordinary method of teaching language: 'In spite of every indication that the youthful mind spontaneously gives that it is led from the perception of particulars to the conception of universal propositions—that it must first see embodied in realities and clothed with circumstances, the ideas which it is afterwards to recognise in their pure, abstract, intellectual form—the prevailing practice is forcibly to drive a child of tender years through the generalities of grammar, unintelligible and uninteresting to him; till at last, in the course of their practical application, the true order of thought is established in his mind, and he understands and appreciates his grammar, through the knowledge which he derives from studying the language itself.'

The ideas thus enunciated were developed with well-known success in Dr. Mayo's own Pestalozzian school at Cheam. They lie at the bottom of the 'Hamiltonian' method, and of the 'Mastery System' of Mr. Prendergast, which is daily commending itself more and more to the minds of educationalists, as the true, rational, and scientific method; and, backed by his able and persevering advocacy, bids fair to revolutionise in the coming generation, the whole English system of teaching languages living and dead.

CHAPTER VI.

The Principles of Pestalozzi.

'A man should know something about everything, and everything about something.' It was a very shallow retort on the part of a distinguished architect, to whom complaint was made that a building which he had erected was crumbling to pieces from defective materials: 'I am an architect, and not a brick-burner.' A consummate artist is bound to be acquainted with the minutest details involved in his art, and an architect should have learned, not only how to burn bricks but to lay them; should be well acquainted with the relative strength and durability of materials, and so ascend through statical certainties and mechanical calculations to these grand imaginative conceptions by which monumental structures are raised, and domes 'hung high in air,' defying the assaults of time. Those who have taken the trouble to follow the history of Pestalozzi thus far will have seen that he possessed in a remarkable, perhaps in an unequalled degree, the gifts by which children's hearts and sympathies are won. He was never so much at home as when surrounded by a circle of little folks, with a child upon his knee, absorbed in the delightful task of making the acquisition of knowledge delightful. It is in this aspect of his character that 'Father Pestalozzi' is best known and best remembered by his own pupils, and those who have learned from them to love him. But it must not be forgotten that along with all the simplicity and gentle enthusiasm of a village dominie of the old school, Pestalozzi was gifted with a profound and original insight into what may be called the 'metaphysics' of education, and that he speaks when he addresses the world at large, with all the authority of a great thinker, and a full confidence in the inspiration of genius.

(To be continued.)

Quarterly Arithmetical Tests.

STANDARD I.—FIRST QUARTER.

1. 140
36
7
501
98

2. 746
341

3. 859
217

4. 2 × 12;
9 × 3;
4 × 7.

SECOND QUARTER.

1. 65
729
4
80
903

2. 561
458

3. 304
30

4. 5 × 3;
4 × 4;
11 × 6.

THIRD QUARTER.

1. 417
608
390
561
872

2. 125
69

3. 903
895

4. 12 × 4;
5 × 9;
8 × 6.

STANDARD II.—FIRST QUARTER.

1. 459 + 70 + 8,065 + 912 + 3,608 + 57,381.
2. From 40,001 take 29,063. Write the answer in words.
3. 80,927 × 59.
4. 32d.; 43d.; 69d.

SECOND QUARTER.

1. 58,073 × 720.
2. 27,156 ÷ 4.
3. What number added to forty-nine thousand seven hundred and six will make one hundred thousand?
4. 83d.; 97d.; 104d.

THIRD QUARTER.

1. 71,386 ÷ 12.
2. 84,957 × 8,006.
3. A man had 250 apples. He sold nine each to eighteen boys. How many had he left?
4. 112d.; 138d.; 142d.

STANDARD III.—FIRST QUARTER.

1. 22,678 ÷ 23.
2. Divide the product of 595 and 456 by 408.
3. How often is five hundred and seventy contained in four hundred and fifty thousand three hundred?
4. In building a house there were used 18,346 red bricks and 2,098 white bricks. How many cartloads were there, reckoning 269 in a load?

SECOND QUARTER.

1. Find the sum of £503 16s. 5½d., £81 10s. 11¼d., £6 15s. 7d., £4 19s. 8¾d., £29 4s. 10½d., and £370 18s. 9¼d.
2. From £805 16s. 4¾d. take £795 17s. 9½d.
3. A boy had a bag of marbles out of which he gave 27 boys 8 each. He then had 84 left. How many had he at first?
4. After spending 4s. 7½d., giving away 2s. 9d., and losing 5½d., how much had I left out of half-a-sovereign?

THIRD QUARTER.

1. Take £8,475 18s. 10½d. from £30,402 6s. 3¼d.
2. What number must be multiplied by 76 to get the same answer as 1,615 multiplied by 348?
3. Eleven pounds eighteen shillings and seven pence farthing + six hundred and five pounds fourteen shillings and nine pence halfpenny + six thousand seven hundred and ninety pounds nineteen shillings and six pence farthing + seven thousand and eighty-six pounds fourteen shillings and eleven pence three farthings + fifty thousand two hundred and nine pounds seventeen shillings and fourpence halfpenny + six hundred and eighteen pounds twelve shillings and ten pence three farthings.
4. A and B have together twenty thousand pounds. If A has £8,706 14s. 9½d., how much has one more than the other?

STANDARD IV.—FIRST QUARTER.

1. £60 13s. 8¼d. × 605.
2. Divide seven hundred pounds and three half-crowns by nineteen.
3. What must be paid for 40 dozen bottles of wine at 4s. 8d. per bottle?
4. £105,709 15s. 11¾d. ÷ 178.

SECOND QUARTER.

1. A man buys 540 marbles at 3 dozen for 2d., and sells them at 10 a penny. What does he gain?
2. How many ounces are there in 2¾ tons?
3. How many tiles 9 inches long will make a border 17 poles in length?
4. A farmer bought 18 sheep for £46 10s. 3d., and sold them for £50. How much did he gain on each sheep?

THIRD QUARTER.

1. Reduce 5 ac. 2,795 sq. yds. to sq. inches.
2. How many stones, &c., are there in one hundred and ninety thousand and seventeen drams?
3. How many seconds are there in the last three months of the year?
4. A man drinks a pint of beer daily, the cost of which is 2½d. How much will he spend in beer in 3 years, one of them being a leap year?

STANDARD V.—FIRST QUARTER.

1. A man owes £670, but can only pay 7s. 9d. in the pound. How much do the creditors lose?
2. What is the cost of 2,417 articles at £7 7s. 7¼d. each?
3. Find the value of 247 qrs. 6 tns. 1 pk. at 34s. 8d. per quarter.
4. What will 17 trucks of coals, each 2 tons 19 cwt. 1 qr., cost at 11s. 8d. per ton?

SECOND QUARTER.

1. If a man pay £37 16s. income tax, at the rate of 7d. in the £, what is his income?
2. Make out a bill for:—
   3 stones of flour at 1½d. per lb.;
   7 doz. lemons at 8 for a shilling;
   4¾ lbs. of sugar at 3d. per lb.;
   7 ounces of tea at 3s. 4d. per lb.;
   5 doz. oranges at 3 for 2d.
3. If 17 cwt. 3 qrs. 7 lbs. are carried 100 miles for 16s. 9d., how far should 4 tons 13 cwt. 3 qrs. be carried for the same money?
4. Bill:
   90 nail-brushes at 5s. 6d. per doz.;
   2 doz. hat-brushes at 1s. 2½d. each;
   3½ doz. clothes-brushes at 2s. 9d. each;
   123 tooth-brushes at 4s. 6d. per doz.

THIRD QUARTER.

1. What must be taken from $\frac{2}{3} + \frac{3}{4}$ to leave $\frac{5}{9}$?
2. A train uses 17 cwt. 36 lbs. of coal a day; what will it use in 23 days?
3. Write $\frac{1}{2}\frac{3}{0}\frac{2}{1}\frac{3}{9}$ in a simpler form.
4. From $(\frac{1}{5} + \frac{3}{8} + \frac{1}{6})$ take $(\frac{1}{2} + \frac{1}{9})$.

STANDARD VI.—FIRST QUARTER.

1. What must $2\frac{1}{9}$ be multiplied by to give $7\frac{2}{3}$?

2. $(5{\cdot}006 \times 3\frac{1}{2}) - (1{\cdot}05 \div {\cdot}064)$.

3. Find the total length of four pieces of cloth, measuring $17\frac{3}{4}$ yards, $25\frac{2}{3}$ yards, $36\frac{7}{16}$ yards, and $49\frac{3}{8}$ yards respectively.

4. Simplify:—

$$\frac{\dot{3}\dot{5} - \dot{2}}{\dot{0}\dot{3}\dot{9}}.$$

SECOND QUARTER.

1. What decimal of £$7\frac{1}{2}$ is $\frac{5}{6}$ of $\frac{3}{4}$ of a crown?

2. If $\frac{1}{8}$ of a ship cost £11,732, what is the value of $\frac{3}{10}$ of the ship?

3. Find the value of ·9 of £2·75 ÷ ·4 of 8·25.

4. After spending $\frac{2}{7}$ of my money I find I have left one five pound note, three half-sovereigns, two half-crowns, and ten pennies. How much had I at first?

THIRD QUARTER.

1. A travels on a tricycle and goes 48 miles a day. B starts 7 days after on a bicycle, and travels 76 miles a day. How long will it take B to catch A?

2. Find the amount of £298 15s. for $6\frac{1}{2}$ years at $3\frac{1}{2}$ per cent.

3. If a clerk have a salary of £96 5s. a year, commencing 1st March, how much should he receive on leaving his employment on the evening of 5th of October?

4. What principal will obtain £49 19s. interest in 3 years at $2\frac{1}{4}$ per cent.?

STANDARD VII.—FIRST QUARTER.

1. If 18 men earn £25 for 4 days' work, how much will 26 men earn in 27 days?

2. What sum will amount to £769 8s. 9d. in $5\frac{1}{4}$ years at $3\frac{1}{2}$ per cent.?

3. If ·625 of a ton be carried 7 miles for £2 6s. 8d., what weight ought to be carried 3 miles for 4s.?

4. If in a school ·68 of the children are boys, and there are 54 more boys than girls, how many children are in the school?

SECOND QUARTER.

1. Find the average of 17 cwt. 22 lbs., 5 tons 11 cwt. 49 lbs., and 19 stone.

2. In what time will £850 amount to £969 10s. $7\frac{1}{2}$d. at $3\frac{3}{4}$ per cent.?

3. A man sold 198 pairs of boots for £133 13s. at a profit of 1s. 9d. per pair. What was the average cost per pair?

4. A leap year began on a Monday. What decimal of the year would the Mondays be? (Answer to five places of decimals.)

THIRD QUARTER.

1. A piano was sold for £41 12s. 6d. at a loss of $7\frac{1}{2}$ per cent. What was the cost price?

2. Find the average of 4·59, 67, ·025, 3·14, 19·008, and ·6.

3. A farmer had 560 animals; $71\frac{3}{7}$ per cent. were sheep, 15 per cent. were cows, and the rest were horses. Find the number of each kind.

4. The number at an examination was 259, of which 234 were successful. What per centage failed? (Answer to three decimal places.)

ANSWERS.

STANDARD I.

	FIRST.	SECOND.	THIRD.
1.	782.	1,781.	2,848.
2.	405.	103.	56.
3.	642.	274.	8.
4.	24; 27; 28.	15; 16; 66.	48; 45; 48.

STANDARD II.

	FIRST.	SECOND.
1.	70,495.	41,812,560.
2.	10,938.	6,789.
3.	4,774,693.	50,294.
4.	2s. 8d.; 3s. 7d.; 5s. 9d.	6s. 11d.; 8s. 1d.; 8s. 8d.

THIRD.

1.	5,948 + 10.	3.	88 apples.
2.	680,165,742.	4.	9s. 4d.; 11s. 6d.; 11s. 10d.

STANDARD III.

	FIRST.	SECOND.	THIRD.
1.	986.	£997 6s. $4\frac{1}{2}$d.	£21,526 7s. $4\frac{3}{4}$d.
2.	665.	£9 18s. $7\frac{1}{4}$d.	7,395.
3.	790 times.	300 marbles.	£65,323 18s. 2d.
4.	76 cartloads.	2s. 2d.	£2,586 10s. 5d.

STANDARD IV.

	FIRST.	SECOND.
1.	£36,714 0s. $11\frac{1}{4}$d.	2s.
2.	£36 17s. $2\frac{3}{4}$d. + 7 q.	98,560 oz.
3.	£112.	374 tiles.
4.	£593 17s. 6d. + 47 q.	3s. $10\frac{1}{2}$d.

THIRD.

1.	34,985,520 sq. in.	3.	7,948,800 sec.
2.	53 st. 4 oz. 1 dr.	4.	£11 8s. 4d.

STANDARD V.—FIRST.

1.	£410 7s. 6d.	3.	£429 9s. 9d.
2.	£17,837 19s. $3\frac{1}{4}$d.	4.	£29 7s. $6\frac{3}{4}$d.

SECOND.

1. £1,296.
2. 5s. 3d. + 10s. 6d. + 1s. $2\frac{1}{4}$d. + 1s. $5\frac{1}{2}$d. + 3s. 4d. = £1 1s. $8\frac{3}{4}$d.
3. 19 miles.
4. £2 1s. 3d. + £1 9s. + £5 15s. 6d. + £2 6s. $1\frac{1}{2}$d. = £11 11s. $10\frac{1}{2}$d.

THIRD.

1.	$\frac{13}{20}$.	3.	$\frac{7}{17}$.
2.	19 tons 18 cwt. 44 lbs.	4.	$\frac{1}{11}$.

STANDARD VI.

	FIRST.	SECOND.	THIRD.
1.	$3\frac{5}{8}$.	·020833.	12 days.
2.	1·11475.	£4,525 4s.	£366 14s. $3\frac{3}{4}$d.
3.	$129\frac{41}{72}$ yds.	13s. 6d.	£57 15s.
4.	$3\frac{1}{3}$.	£9 10s. 2d.	£740.

STANDARD VII.

	FIRST.	SECOND.	THIRD.
1.	£243 15s.	2 tns. 3 cwt. 75 lbs.	£45.
2.	£650.	$3\frac{3}{4}$ years.	15·72716.
3.	·125 ton or $2\frac{1}{2}$ cwt.	11s. 9d.	400 sheep, 84 cows, and 76 horses.
4.	150 children.	·14480...	9·652...%

Our Certificate Class.

BY DR. GEORGE BEACH, M.A.

Head Master of Christ Church School, Macclesfield.

EUCLID.

In our view there is no other branch of Mathematics comparable with Euclid as regards practical utility and educational value. Without its results, Astronomy, Optics, Mechanics, Navigation and a host of kindred sciences could not exist except in rudimentary forms. Perhaps it is not too much to assert, that there is NO physical science but is deeply indebted to Euclid, whilst to the ordinary artisan it is also extremely helpful. Its educational value, disciplinary and logical, is immense in correcting any tendency towards fallacious and diffuse reasoning, or illogical assumptions. Like an old Roman road lasting throughout generations, it traverses the mathematical area, and is still the great highway to geometrical results.

Its only danger is the one common to mathematical research in general, and to which incredulous minds are peculiarly susceptible, that of refusing credit to all things (and there are many such) that cannot be weighed, measured, calculated, or demonstrated with absolute and precise certainty. Literary study, especially of poetry, is, however, an efficient rectifier of this narrowing tendency, and is in fact its natural antidote.

As regards the Certificate Exam. the questions propounded before 1882 are not of much technical assistance to us, but on the other hand, the queries of the last six years are materially helpful; and on these latter we therefore base our observations.

Only eight questions are allowed to be answered, and at least a dozen will be given from which the selection may be made. The first eleven will probably be duplex, consisting both of a proposition and a deduction, whilst the twelfth will be a deduction alone, but presenting more than average difficulty. In answering, 'Capital letters (excluding A, B, C, D, E, F), not numbers, must be used in the diagrams. The only signs allowed are + and =. The square on PQ may be written "sq. on PQ," and the rectangle contained by PQ and RS, "rect. PQ, RS." Other abbreviations, if employed, must not be ambiguous.'

First will doubtless come (as is the invariable practice) two questions on Book I., followed by one question on Book II., four on Book III., two on Book VI., and lastly the aforesaid difficult deduction.

The examiners appear to have no favourite questions in Book I., but throughout the remaining books the inquisitorial mind is fairly manifest. In Book II., Propositions 3, 4, 12, 15; in Book III., Propositions 3 (set four times), 15, 17, 18 (set three times), 22 (four times), 32, 35, 36; in Book IV., 4, 5, 6, 10 (four times); in Book VI., 2 (four times), 8, 13 are evidently in the highest esteem.

The Propositions should be frequently revised by the pupil. This even with our limited time is quite practicable as from forty to sixty minutes is quite sufficient to re-peruse even Book I. or III. The practice of merely committing to memory is as useless as it is foolish.

Not only should Euclid's results be thoroughly understood, but an intelligent idea of the logical methods employed (such as 'Superposition,' 'Reductio ad Absurdum,' 'Reductio ad exhaustum') should be conceived. All the divers converses of theorems, all the terms employed, all the restrictions introduced, should be capable of enunciation and explanation by the student.

The Deductions (and we use the term generically to comprise 'Riders,' 'Exercises,' 'Cuts,' etc.) are generally based upon the annexed propositions. Those upon Book III., and those from Book I. applied to exercises upon other 'Books,' are most in vogue. 'Candidates are reminded that correct solutions of the Deductions obtain high marks.'

They are thus of higher value than the Propositions, and rightly so, for they are practically innumerable and cannot be mechanically crammed up like the limited number of the Propositions.

Even books of Deductions should only be used like Arithmetical 'Keys.' They are exceedingly useful as walking-sticks, but utterly useless as crutches.

The examinee must become skilled in Geometrical Analysis (specimens of which are given in every good edition of Euclid) and especially should be able to construct triangles, as these are really the foundation of all constructions.

If when our students are endeavouring to solve Deductions, they are able to propound original ones which their investigations have suggested, the unction of confidence may be fairly applied, but the mind which cannot originate Deductions cannot retain communicated ones.

The following 'Key' Deductions are of essential importance, and are useful (speaking generally) throughout all the 'six books.'

'The line joining the middle points of the sides of a triangle is parallel to the base.'

'The middle point of the hypotenuse of a right angled triangle is equidistant from the three angles.'

'The perpendicular from a given point upon a given straight line is the shortest line that can be drawn from the point to the line.'

'The diagonals of parallelograms bisect each other.'

'Equal triangles upon equal bases are between equidistant parallels.'

'The sum of the squares on the sides of any triangle is double of the sum of the squares on half the base, and the line joining the vertex to the middle point of the base.'

'The common chord of two intersecting circles bisects the common tangent.'

Considerations of symmetry frequently assist the solver, *e.g.*, 'in inscribing an equilateral triangle in a square.' Here it is evident that the sides of the triangle must meet in the extremity of, and be equally inclined to the diagonal of, the square.

By considering extreme 'cases' we can often arrive at a general solution, as in 'if from any point without a circle, lines be drawn cutting the circle, and making equal angles with the longest line, they will cut off equal segments.'

By imagining the extreme case, where the given point is in the circumference, the demonstration is at once suggested.

A general solution can often be built up from the simple cases, see Euclid III., 35.

As Book III. is so much utilised, it would be well for the student to take the elements of ordinary problems (such as points, lines, angles, circles, touching, cutting, intercepting) and combine them (generally in threes) into every possible variety.

A very difficult and instructive exercise is to prove that certain problems are impossible.

Maxima, Minima, Constants and Loci, should not be neglected. Proposition III., 15, is an example of Maxima, and Propositions III., 7 and 8 of both Maxima and Minima. As an instance of 'Constants,' 'The sum of the opposite angles of any quadrilateral figure described in a circle is invariable,' may be adduced. As a specimen of 'Loci' take the following: 'The loci of the vertices of all equal triangles upon the same base are lines parallel to this base.'

ALGEBRA.

Eleven questions may probably be answered in Algebra and Mensuration, nine in the former subject and two in the latter, and very little latitude of choice is allowed; in fact the paper is (speaking relatively) a distinctly difficult one, demanding a thorough knowledge of the subjects.

None of the points enumerated in the Second Year Syllabus ever remain untested; the First Year Course is likewise again brought under review, and the general algebraic proficiency of the candidate is examined into. In connection with the amount of knowledge required it is instructive to notice the words 'at least' in the foot-note which expands this part of the Syllabus. Scales of Notation although not expressly mentioned are sometimes asked for under cover of this phrase.

As is natural in a fairly advanced paper, not only are problems and mechanical questions propounded, but the proofs of various formulae and theorems, and the explanation of divers processes are demanded.

'Solutions must be given at such a length as to be intelligible to the Examiner, otherwise the answer will be considered of no value.'

In Mensuration the relative value of cubes, spheres, cylinders, and cones of the same altitude, with problems respecting rings, hollow bodies, and frustra of cones, are favourites; $3\frac{1}{7}$ is always assumed as the value of π, and answers need not be carried farther than two decimal places.

Male candidates who have not been previously examined, or have failed, or who have not passed satisfactorily in Arithmetic, must take Arithmetic instead of Mensuration.

Factors.—The importance of facility in factorising cannot be too much insisted on. The most advanced student can always find something to learn about factors. Knight's Algebraic Factors, published by Blackie, is a very helpful little work.

Besides the directions usually given, attention is solicited for the following three methods.

A. When the coefficients of an expression can be disintegrated into groups, so that each group has its coefficients in the same ratio, the expression may be factorised. This process is really separating the product into the various expressions (lines of a multiplication sum) of which it is the total.

Example. $6x^5 - 4x^4y - 11x^3y^2 - 3x^2y^3 - 3xy^4 - y^5 =$
$6x^5 - 12x^4y + 3x^3y^2 - 3x^2y^3 + 8x^4y - 16x^3y^2 + 4x^2y^3 - 4xy^4 +$
$2x^3y^2 - 4x^2y^3 + xy^4 - y^5 =$
$3x^2(2x^3 - 4x^2y + xy^2 - y^3) + 4xy(2x^3 - 4x^2y + xy^2 - y^3) +$
$y^2(2x^3 - 4x^2y + xy^2 - y^3) =$
$(3x^2 + 4xy + y^2)(2x^3 - 4x^2y + xy^2 - y^3).$

B. When the algebraic sum of the coefficients of a sum is zero, $x - 1$ is a factor.

Example.
$x^4 - 7x^3 + 4x^2 - 5x + 7 = (x - 1)(x^3 - 6x^2 - 2x - 7).$

C. To factorise $12x^2 + 22xy + 8y^2$. $12 \times 8 = 96$. Now find two numbers whose sum is 22 and product 96. These are 16 and 6. Then proceed as in 'A.'

$12x^2 + 22xy + 8y^2 = 12x^2 + 16xy + 6xy + 8y^2 = 4x(3x + 4)y +$
$2y(3x + 4y)$
$= (4x + 2y)(3x + 4y).$

Miscellaneous Notes.—Be prepared to solve Quadratics by factorising, after having arranged the equations in the form $3x^2 - 5x - 28 = 0$, $3x^2 - 12x + 7x - 28 = 0$, $3x(x - 4) + 7(x - 4) = 0$, $(3x + 7)(x - 4) = 0$, $(3x + 7) = 0$, and $(x - 4) = 0$, etc.

A good instance of this principle is found in the 5th Question of the 1884 paper. 'Find the common root of these equations.'

$x^3 - 9x^2 - 16x + 144 = 0$, $(x + 4)(x - 4)(x - 9) = 0$
$x^3 + 7x^2 - 20x - 96 = 0$, $(x + 3)(x - 4)(x + 8) = 0$

Prove the theorems.

'When $n + 1$ figures of a square root have been obtained by the ordinary method, n more may be obtained by ordinary division only, if the root contain but $2n + 1$ figures.'

'When $n + 2$ figures of a cube root have been obtained by the ordinary method, n more may be obtained by ordinary division only, if the root contain but $2n + 2$ figures.'

The twenty exercises on the Progressions, in Todhunter's larger Algebra, should be worked, as invariably they appear more or less disguised in the Examination Paper.

The number of combinations of n things taken r at a time is always asked for, and frequently the number of permutations of n things (which are not all different) taken altogether.

Investigate the method for extracting the square root of a binomial surd, one of whose terms is a quadratic surd, and the other rational.

Be able to prove that Log n to the base b may be found by multiplying $\text{Log}_a n$ by $\text{Log}_b a$ or by $\frac{1}{\text{Log}_a b}$.

The process of obtaining the co-efficients of any expansion of $(x + y)^n$ may be thus popularised. Take for instance $(x + y)^7$. Here the 1st C. is 1, the 2nd C. is $\frac{7}{1}$ of the 1st C., the 3rd C. is $\frac{6}{2}$ of the 2nd C., the 4th C. is $\frac{5}{3}$ of the 3rd C., etc.

'In the expansion of $(x + y)^n$, the C. of the rth term from the beginning is equal to the C. of the rth term from the end.' For the rth term from the beginning may be made the rth term from the end, by writing $(y + x)^n$ instead of $(x + y)^n$.

Both in the combinations, permutations and the binomial theorem many common sense and yet scientific methods of proof (as the above instance) will suggest themselves, which are quite as good as the more ordinary, ponderous and formal proofs. Instances of 'Mathematical Induction' should be mastered.

ARITHMETIC.

FOR FEMALES.

For the last eight years ten questions is the maximum number allowed to be answered, and these selected from fourteen or fifteen. The ample time of two and a half hours, or fifteen minutes per sum is granted. 'The solutions must be given at such length, as to be intelligible to the Examiner, otherwise the answers will be considered of no value.' One question at least is every year set upon Discount, Stocks, Compound Interest, Square Root, Insurance, Percentages, Vulgar or Decimal Fractions, and problems involving either G.C.M. or L.C.M., and very frequently, though not annually, upon Ratios, Proportionate Shares, Partnerships, Clock sums (gaining or losing time, position of fingers), Averages, 'Mixtures,' Compound Proportion, the properties of the figure '9,' the peculiarities of the Calendar, and the Theory of Vulgar and Decimal Fractions.

Queries have also appeared respecting the theory of nearly all the rules required, and definitions or explanations of the terms etc., fraction, ratio, proportion, fourth and third proportionals, finite and recurring decimals, root, factor, measure, multiple, power, numeration, average, prime, composite, concrete, and abstract numbers, true and bankers' (ordinary) discount, present worth, the funds, stocks, stocks at a premium or discount, brokerage and cancelling.

Proofs of the common arithmetical operations, and the 'short cuts' of Mental Arithmetic should be capable of easy and rapid reproduction, and our old friend 'demonstrate the rule for converting a "mixed repeater" into its equivalent vulgar fraction' should not be forgotten.

The relations of discount, interest, present worth and principal to each other, and of the three dimensions of space to one another must be thoroughly digested.

It will also be necessary to know how to calculate the areas of squares and rectangles (especially when faces of solids or hollow figures) and the cubical content of rectangular solids. Elementary Algebra, as far as the solution of simple equations, is of enormous assistance.

These formulæ should be committed to memory:—$A = L \times B$, $L = \frac{A}{B}$, $B = \frac{A}{L}$; $C = A \times H$, $C = L \times B \times H$, $A = \frac{C}{H}$, $H = \frac{C}{A}$; where L = length, B width or breadth, H = height, depth, or thickness, A = superficial area, and C = cubical content.

Note that a fraction (say $\frac{3}{4}$) means $3 \div 4$, $\frac{1}{4} \times 3$, and as 3 is to 4,—and that in clock sums respecting the position of the hands (or fingers), the principle is 'that the big finger gains on the little finger 55 minutes in every hour,'—and that there cannot be square or cubic measures of weight or value, but only of extent.

Problems out of the usual 'rut' involving the principles of the G.C.M. (H.C.F.), L.C.M., and compound interest, and those where rate per £ and per cent. are mixed, are not to be neglected. For Miscellaneous problems make extensive use of Capel's 'Catch Questions.'

ANSWERS TO CORRESPONDENTS.

We shall be pleased to reply briefly, and through this column, to any seeking information or advice.

Answers demanding urgency will be promptly forwarded per post on receipt of stamped and addressed envelope.

A Correction.—In the August Routine for Females, 2nd Lesson of Wednesday, Week two, please read 'between Discount and Interest' instead of 'between Principal and Present Worth.'

ENQUIRER (Middlesboro').—The Paraphrasing for Females is from 'Cæsar' only, and not from 'Addison,' whilst the language, style, and allusions should be from 'Addison only.' It is not safe, however, altogether to neglect these latter points in 'Cæsar.'

'Hopeful One,' 'Comus,' 'Insipiens (Incipiens ?)' answered per ordinary letter.

CENSOR.—We have at your command invoked our muse of literal translation with the following result—

'Now mid the lines of his embattled powers
The lofty general of the pigmies stalks,
Awful, majestic; solemnly he walks,
And with gigantic body all the rest o'ertowers,
Rising amidst them, in his stature tall
He by his elbow's height, exceeds them all.'

PUZZLED ONE.—We think that a little study will enable you to decipher the meaning. The first part of the Mnemonic represents the event, and the last three (or four) letters each denote a figure, thus giving the date. Try again. You will certainly make a very good writer, but at present your capitals require attention, and in the large-hand, you should join your letters higher up.

ROUTINE FOR SEPTEMBER. (MALES.)

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	(1) The Conscience Clause (2) Law with regard to Half-Timers (3) Law of School Fees (4) Farming of Schools *v.* Fixed Salaries	Revise all the Definitions and Axioms, &c., of Euclid, up to Book VI. (inclusive)	Paraphrase last 14 Lines of Cæsar	Euclid — Problems on Plane Loci	Paraphrase Lines 617—635 of Comus	Revise Geography of England	The mixture of Southern, Eastern, and Northern Mythology of Comus	Map of New Zealand	History — Twenty-fifth chapter of McCarthy	'Happiness consists not in Virtue's reward, but in Virtue itself' Explain this aphorism, contrasting Habits and Character with Material Prosperity	Revise Deductions of Books I. and II.	The Prosody of Cæsar and Comus
TUESDAY	Geography of British North America	Arithmetic or Algebra	Outlines of History, to end of William III.	Arithmetic, Algebra, or Mensuration	History — Revise McCarthy	Music — Terms in common use relating to expression, pace, and style	The Prosody of Cæsar and Comus	Algebra — Logarithms	Petition of Rights, Declaration of Rights, Bill of Rights, Acts of Settlement	First 17 Props. of Euclid, Book VI.	Revise Notes of Comus	Treatment of 'Ringworm,' 'Stammering,' 'Squinting,' 'Itch,' and 'Breaking of Voice'
WEDNESDAY	Algebra — Interest	Fallacies — pp. 119—128 Jevon's Logic Primer	Triangles are equal when?	Algebra — Annuities	Euclid, Book II., and to Prop. 8, Book III.	Write 30 lines of Composition on the character of Cicero	Prove that only three regular figures can fill up space round a point	Paraphrase from Essay on Addison 'We must look for the explanation of this seeming miracle.... of every remarkable word uttered in the deliberations of the legislature'	What operations of man can affect climate?	Geography of British North America	Arithmetic, Algebra, or Mensuration	History — Revise McCarthy
THURSDAY	Write 30 lines of Composition upon 'None but such as are good men can give good things'	Write a Large-hand copy of 'Philanthrophy' and a Small-hand copy of 'Difficulties will make a wise man exert himself'	Euclid, Book I.	Geography of British North America	Arithmetic, Algebra, or Mensuration	Lives of Nelson, Fox, Wesley, Johnson, Milton, and Swift	Arithmetic or Mensuration	Algebra — Permutations and Combinations	Revise Outlines of History — The Administrations of Justice	All the Preface of Cæsar	Arithmetic or Algebra	General Directions to a P.T. for Drawing up Notes of Lessons
FRIDAY	Preface to Cæsar from p. 5 to line 4 p. 18	Geography of Currents and Tides	Outlines of History to end of Anne	Arithmetic, Algebra, or Mensuration	Canon Warburton's Article in our August issue on Pestalozzi	Euclid — Maxima and Minima	What does the present disposition of Flora and Fauna teach us concerning the former disposition of Land?	Euclid, Book IV.	Give an account of the 'Coolness' between Pope and Addison	Deductions of Euclid, Book VI.	The Quotations, Latin, Greek, and English, of Addison	Map of British North America
SATURDAY	Important Dates to end of Anne — The Cabinet and Ministry	Preface to Cæsar to middle of p. 29	Algebra — Annuities	Revise 'Laws of Health as applied to School premises'	Preface and Dramatis Personæ of Comus — Revise Plot of Comus	'Form IX.' and its items	Euclid, Book III., Prop. 9 to end	Algebra — Difficult Equations	Draw rough 'Sketch Maps'	Arithmetic or Mensuration	Outlines of History to end of George I.	Algebra — The Binomial Theorem	Arithmetic	Important Dates to end of George II.	Algebra — The Binomial Theorem	Write out (for future use) a Summary of Canon Warburton's last Article on Pestalozzi

ROUTINE FOR SEPTEMBER. (FEMALES.)

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	(1) The Conscience Clause. (2) Law of Half-Timers. (3) Law of School Fees. (4) Farming of Schools *v.* Fixed Salaries	Analyse and Parse difficult words of lines 31-49 of Cæsar, Act V. Scene 4	Geography of our European Possessions	War of the French Revolution (1793)	Discount	Geography of our Asiatic Possessions (excluding India and Burmah)	What are the uses of Lime-juice, Camomile, Cod Liver Oil, Nitrate of Silver, and Ipecacuanha?	Fallacies. — pp. 112, 128 Jevon's Logic Primer	Maps of St. Lawrence and the Murray	Stocks	'What do we export to our principal Possessions?	Describe the character of Cicero, as depicted in the play
TUESDAY	The Cabinet (see last month's article). The Privy Council. The Ministry	Compound Proportion	Paraphrase lines 57-78 of Cæsar, Act I. Scene 3	Map of the North Sea and Geographical Revision	What 'extraordinary expenses' should a working-man provide for, and to what extent weekly?	Practise diagonal and plain darns	Revise 'Laws of Health as applied to School Premises'	What accessions of Territory have been ours since 1885?	Our scattered Oceanic Possessions	History. — Dates	How should Herring, Mackerel, Cod, and Salmon be cooked? What is the special value of a fish diet?	Cut out the Sleeve and Collar of a Woman's Nightdress, and Wristbands of a Boy's Shirt
WEDNESDAY	What parts of our food tend respectively to produce Warmth, Fat, Muscle, Strength, and Size of Bone?	General directions to a P. T. for drawing up Notes of Lessons	Practise Needlework Diagrams	Spinning Jenny (1764), Spinning Machine (1768), The Mule (1770), and their effects on Trade and Population	Proo's of Arithmetical Rules	The Prosody of Cæsar	Revise Geography of British Isles	How should meat be stewed (1) to make soup, (2) to be eaten? Give reasons for the different methods	Canon Warburton's Article, in our August issue, on Pestalozzi	Who were Budgell, Phillips, Tickell, Wharton, John Dennis, and Miss Aikin?	In how many pieces should the three required garments be cut?	'Form IX.' and its items
THURSDAY	Maps of the Ganges and the Shannon	Practise setting-in 'gathers' and feather-stitching	Insurance	Treatment of 'Ringworm,' 'Stammering,' 'Squinting,' 'Itch,' and 'Breaking of Voice'	Describe any systems of 'Penny Dinners' that you are acquainted with	Lives and Works of Johnson, Goldsmith, Bentham, Cowper, Burns, and Gibbon	Analyse and Parse difficult words of lines 35-43 of Cæsar, Act I. Scene 1	Ceylon, 1795-6 — African Company, 1750 — Newfoundland (1714) and the Fishery Question	The uses of Colonies and Dependencies, giving examples	Draw rough 'Sketch Maps'	Revise 'Food for the Sick' from Text-Book	Present-Worth
FRIDAY	Revise 'Household Management' from Text-Book	Square Root and Fourth Root, etc.	India under Warren Hastings and Lord Cornwallis. — Battle of Seringapatam	Paraphrase lines 71-92 of Cæsar, Act III. Scene 2	Cut out the left half of a child's muslin pinafore	Music — Terms in common use relating to expression, pace, and style	'High' Interest is bad Security.' Explain this axiom, and give instances of its application	Describe the character of Addison	Practise Seaming, Felling, and Simple and Counter Hemming	'Happiness consists not in Virtue's reward but in Virtue itself.' Explain this aphorism, contrasting Habits and Character with material Prosperity	Re-read the first half of Addison	History — Dates
SATURDAY	Addison's 'Campaign' 'departed from a ridiculous fashion.' What fashion was this; and what better style did he introduce?	The Whiteboys. United Irishmen (1791). Orangemen (1795). Vinegar Hill (1798)	General view of our Empire	Write a Largehand copy of 'Philanthropy,' and a Smallhand copy of 'Difficulties will make a wise man exert himself'	Stocks	Preface to Cæsar, from page v. to line 4, page xviii.	How would you diet (1) a patient after a lengthened fast? (2) a person suffering from skin disease?	Plain Needlework	Arithmetic — Miscellaneous Problems	Preface to Cæsar, to middle of page xxix.	Practise 'any 'Needlework'	War of the French Revolution (1793)	The Prosody (and Scanning) of Cæsar	General view of our Empire	Arithmetic — Miscellaneous Problems	Write out (for future use) a Summary of Canon Warburton's last article on Pestalozzi

Jeanne d'Arc, by Lamartine.

TRANSLATED BY A. M. BOWER,

Late Master in University College School, London.

JEANNE D'ARC.	JOAN OF ARC.
CHAPTER XV.—*continued.*	
Baudricourt la congédia	Baudricourt dismissed her
pour réfléchir,	in order to reflect,
craignant sans doute	being afraid no doubt
de trop mépriser ou de trop croire	of despising or believing too much
dans un temps où	at a time when
l'incrédulité autant que la croyance	unbelief as well as faith
pouvait lui être imputée	might be reproached him
à faute par la voix publique.	as a fault by the voice of the nation.
Il en référa prudemment au clergé,	He prudently submitted the case to the clergy,
juge en matière surnaturelle.	the (proper) judges in supernatural matters.
Il consulta le curé de Vaucouleurs.	He consulted the parish priest of Vaucouleurs.
Ils allèrent ensemble avec solennité	They went solemnly together
visiter la jeune paysanne	to visit (see) the young peasant
chez sa cousine,	at the house of her cousin,
la femme du charron.	the wheelwright's wife.
Le curé, pour être prêt	The parish priest, in order to be ready
à toute occurrence,	for every eventuality,
avait revêtu ses habits sacerdotaux,	had put on his priestly vestments
armure contre l'esprit tentateur.	(as) armour against the evil spirit.
Il exorcisa Jeanne,	He exorcised Joan,
au cas où elle serait obsédée	in case she should be possessed
d'un démon, et la somma	by an evil spirit, and summoned her
de se retirer si elle était	to depart if she had
en commerce avec Satan.	dealings with Satan.
Mais les démons de Jeanne	But the evil spirits of Joan
n'étaient que sa piété et son génie.	were only her piety and her genius.
Elle subit l'épreuve	She underwent the proof
sans donner aucun scandale	without giving any scandal
au prêtre et à l'homme de guerre.	to the priest and the warrior.
Ils se retirèrent indécis et touchés.	They withdrew undecided and deeply moved.
XVI.	
Le bruit de cette visite	The noise of this visit
du gouverneur et du prêtre	of the Governor and priest
chez la femme du charron	to the wheelwright's house
étonna et édifia la petite ville.	astonished and edified the small town.
Le peuple de toute condition	People of all ranks,
et les femmes surtout s'y portèrent.	especially women, came to see her.
La mission de Jeanne devint	Joan's mission became
la foi de quelques-uns	an article of faith to some
et l'entretien de tous.	and of conversation to all.
Le bruit avait trop éclaté	The report had spread too far
pour qu'il fût loisible	for it to be possible
à Baudricourt de l'étouffer.	for Baudricourt to stifle it.
L'opinion l'accusait déjà	Public opinion already accused him
d'indifférence et de mollesse.	of indifference and want of energy.
'Négliger un tel secours du ciel,	'To despise such assistance from heaven,
n'était-ce pas trahir	was it not betraying
le Dauphin et la France?'	the Dauphin and France?'
Un gentilhomme des environs,	A gentleman of the neighbourhood,
étant venu voir Jeanne	having gone to visit Joan
comme les autres, lui dit,	like the others, said to her,
en manière d'accusation contre Baudricourt :	by way of accusing Baudricourt :
'Eh bien, ma mie,	'Well, my dear maid,
il faudra donc que le roi soit chassé	the King must, I suppose, be banished
et que nous devenions Anglais?'	and we must become English?'
Jeanne mêla ses plaintes	Joan mingled her complaints
à celles du gentilhomme et du peuple,	with those of the gentleman and the nation,
mais elle parut moins se lamenter	but she seemed less to lament
sur elle-même que sur la France ;	over herself than over France ;
et, se rassurant sur la promesse	and, strengthening herself with the promise,
qu'elle avait entendue d'en haut :	which she had heard from above :
'Cependant, dit-elle,	She exclaimed: 'Nevertheless,
il faudra bien qu'avant la mi-carême	it is necessary that before mid-Lent
on me conduise au Dauphin,	I must be taken before the Dauphin,
dussé-je, pour y aller,	even if I should be obliged, to reach there,
user mes jambes jusqu'aux genoux.	to wear away my legs even to the knees.
Car personne au monde, ni rois,	For no one in the world, neither kings,
ni ducs, ni fille du roi d'Ecosse,	nor dukes, nor the King of Scotland's daughter,
ne peuvent reprendre le royaume de France ;	can recover the kingdom of France ;
et il n'y a pour lui	and there is for him
d'autres secours que moi-même,	no other help than myself,
quoique j'aimasse mieux,'	although I should have preferred,'
ajouta-t-elle avec tristesse,	she added sadly,
'rester à filer	'to stay at home spinning
près de ma pauvre mère!...	near my poor mother.
Car je sais bien que	For I know very well that
batailler n'est pas mon ouvrage ;	fighting is not my work ;
mais il faut que j'aille et que je fasse	but I must go and do
ce qui m'est commandé,	what is commanded me,
car mon Seigneur le veut.'	for my Master wills it.'
On lui demanda :	They asked her :
'Et qui est votre Seigneur?'	'And who is your Master?'
Elle répondit : 'C'est Dieu!'	She answered : 'God!'
Deux chevaliers présents s'emurent,	Two knights present were deeply moved ;
l'un jeune, l'autre vieux.	the one young, the other old.
Ils lui promirent sur leur foi,	They promised her, on their honour,
la main dans sa main,	with their hands in hers,
qu'avec l'aide de Dieu	that with God's help
ils lui feraient parler au roi.	they would enable her to speak to the king.

XVII.

Pendant ces délais	During these delays
qui semblaient commandés	which seemed necessary
par le respect même pour le Dauphin,	out of respect for the Dauphin,
Baudricourt conduisit Jeanne	Baudricourt conducted Joan
au duc de Lorraine,	to the Duke of Lorraine,
de qui il relevait à Vaucouleurs,	under whom he held his fief at Vaucouleurs,
afin de décharger sa responsabilité	in order to discharge his responsibility
et de prendre ses ordres.	and receive his orders.
Le duc vit Jeanne et l'interrogea	The Duke saw Joan and questioned her
sur une maladie	about a disease
dont il était en ce moment affligé.	by which at that time he was afflicted.
Elle ne lui parla que	She spoke to him
de guérir son âme	only of healing his soul
en se réconciliant avec la duchesse	by becoming reconciled to the Duchess
dont il était séparé.	from whom he was separated.
Baudricourt la ramena à Vaucouleurs.	Baudricourt took her back to Vaucouleurs.
Pendant le voyage et le séjour	During the journey and the residence
de Jeanne chez le duc de Lorraine,	of Joan at the Duke of Lorraine's,
le Dauphin lui-même avait été avisé	the Dauphin himself had been informed
par lettres de la merveille de Domremy.	by letters of the wonderful apparition of Domremy.
Quelques-uns pensent que	Some people think that
Baudricourt avait voulu prendre,	Baudricourt had wished to take,
avant toute résolution,	before (adopting) any resolution,
les ordres du Dauphin et de sa belle-mère,	the orders of the Dauphin and of his mother-in-law,
la reine Yolande d'Anjou :	Queen Yolande d'Anjou :
le Dauphin, la reine Yolande	the Dauphin, the Queen Yolande
et le duc de Lorraine	and the Duke of Lorraine
devaient se concerter avec Baudricourt	were to concert measures with Baudricourt
pour faire profiter à leur cause	to turn to the advantage of their side (cause)
l'apparition d'une jeune,	the appearance of a young,
belle et pieuse fille,	beautiful, and pious maiden,
digne de protection divine	worthy of divine protection
pour les peuples, d'enthousiasme	for the nations, of enthusiasm
pour l'armée, de délivrance	for the army, of deliverance
pour le royaume.	for the kingdom.
Cette opinion n'a rien que de vraisemblable,	This opinion is most likely,
et la politique d'une pareille foi	and the policy of such a belief
n'en exclut pas la sincérité	does not exclude its sincerity
dans un siècle où les cours et les camps	in an age when courts and camps
partageaient toutes les croyances du peuple.	shared all the beliefs of the people.
Les préparatifs pour le voyage	The preparations for the journey
et pour la réception de Jeanne à la cour,	and for the reception of Joan at the court,
et les respects du Dauphin	and the great respect of the Dauphin
et de la reine Yolande	and of Queen Yolande,
pour elle à son arrivée,	for her on her arrival,
montrèrent assez	were sufficient proof
qu'on attendait le prodige	that they expected a marvel
et qu'on désirait le faire éclater.	and they ardently longed to see it manifested.

XVIII.

Les habitants de Vaucouleurs achetèrent	The inhabitants of Vaucouleurs bought
à Jeanne un cheval du prix de seize francs	for Joan a horse for sixteen francs,
et des habits d'homme de guerre	and a soldier's dress
pour protéger sa personne	to protect her person,
autant que pour manifester sa mission guerrière.	as well as to indicate her warlike mission.
Baudricourt lui donna une épée.	Baudricourt presented her with a sword.
Le bruit de son départ	The report of her departure
pour l'armée s'étant répandu	for the army having spread
jusqu'à Domremy, son père,	as far as Domremy, her father,
sa mère, ses frères accoururent	mother and brothers hastened
pour la retenir et la reprendre.	to detain her and take her home.
Elle pleura avec eux, mais ses larmes	She wept with them, but her tears,
amollissant son cœur,	(although) they softened her heart,
ne purent amollir sa résolution.	(yet) could not weaken her resolution.
Elle partit, en compagnie	She set out, in company
des deux gentilshommes	with two noblemen
et de quelques cavaliers de leur suite,	and some cavaliers of their suite,
pour Chinon où était le le Dauphin.	for Chinon, where the Dauphin was.
Son escorte lui fit traverser	Her escort made her travel
rapidement les provinces	rapidly through the provinces
où dominaient les Anglais et les Bourguignons,	in which the English and Burgundians held sway,
dans la crainte que	from the fear that
leur dépôt ne leur fût enlevé.	their charge might be carried off from them.
Indécis d'abord sur la nature	Uncertain at first as to the nature
des inspirations de la jeune fille,	of the inspirations of the young girl,
tantôt ils la vénéraient	sometimes they reverenced her
comme une sainte,	as a saint,
tantôt ils s'en éloignaient	at other times they kept at a distance from her
comme d'une sorcière	as from a sorceress
possédée d'un mauvais génie.	possessed by an evil spirit.
Quelques-uns même délibérèrent	Some even deliberated
secrètement s'ils ne s'en déferaient pas	secretly whether they should not get rid of her
en route en la précipitant	during the journey, by hurling her
dans quelque torrent des montagnes	down into some mountain stream
et en attribuant sa disparition	and attributing her disappearance
à un enlèvement du démon.	to the carrying off of a demon.
Souvent, près d'exécuter leur complot,	Often (when) on the point of executing their project,
ils furent retenus	they were restrained
comme par une main divine.	as by a divine hand.
La jeunesse, la beauté, l'innocence	The youth, beauty, innocence,
et la sainte candeur de la jeune fille	and the saintly candour of the young girl
furent sans doute le charme	were doubtless the charm
qui fléchit leurs cœurs et leurs bras.	which subdued their hearts and arms.
Partis incrédules,	(Although they) set out incredulous,
ils arrivèrent convaincus.	they arrived convinced.

XIX.

La cour errante était	The wandering court were
au château de Chinon, près de Tours.	at the castle of Chinon, near Tours.
On y attendait l'inspirée de Vaucouleurs	There they awaited the inspired (maiden) of Vaucouleurs
avec des sentiments divers.	with various feelings (thoughts).
Les conseillers réputés les plus sages	The councillors, reputed the wisest,
déconseillaient le Dauphin d'accueillir	endeavoured to dissuade the Dauphin from receiving
et d'écouter une infant qui,	and listening to a young girl who,
si elle n'était pas un instrument	if she were not an instrument
de l'ange des ténèbres,	of the angel of darkness,
était au moins la messagère	was at least the messenger
de sa propre illusion.	of her own illusions.
D'autres, plus crédules ou plus légers,	Others, more credulous or more thoughtless,
poussaient le Dauphin à consulter du moins cet oracle.	urged the Dauphin at least to consult this oracle.
La reine Yolande et les favorites	Queen Yolande and her favourites
étaient fières que le salut vînt d'une femme.	were proud that deliverance should come from a woman.
Faciles à croire, portées à séduire	Credulous (= easy of belief), apt to lead astray
et à être séduites,	and to be led astray,
elles sentaient que les moyens humains	they perceived that all human means
de relever la cause du roi	of restoring (reviving) the king's cause
étaient épuisés et qu'un ressort surnaturel,	were exhausted, and that a supernatural impulse,
vrai ou supposé,	real or supposed,
pouvait seul rendre l'enthousiasme	could alone restore enthusiasm
avec l'espérance aux soldats et aux peuples.	with hope to the soldiers and people.
'C'était peut-être Dieu	'It was perhaps the Almighty
qui suscitait ce secours.'	who raised up (sent) this help.'
Politique ou crédulité,	(Whether it was) policy or credulity,
tout était bon	all means were acceptable
pour une cause vaincue et désespérée.	to a vanquished and despairing cause.
Le Dauphin flottant, comme le jeunesse,	The Dauphin wavering, like youth,
de l'amour à la gloire	between love and glory,
et des conseils graves aux conseils féminins,	grave counsels and woman's advice,
était à une de ces crises	was in one of those crises
d'affaissement moral où	of moral prostration when
l'on est enclin à tout croire	we are inclined (ready) to believe everything
parce qu'on n'a plus rien à attendre.	because we have nothing more to expect.

Grammatical Notes, Questions, Sentences, and Pieces for Translation to Jeanne d'Arc.

CHAPTER XVI.

S'y portèrent (carried themselves there). How do you do = comment vous portez-vous = how do you carry yourself? or comment allez-vous? (= how goes it?). Ma amie was formerly m(a)amie, my dear girl. In old French m', t', s', were used instead of ma, ta, sa, before a fem. sing. noun beginning with a vowel. In *dussé*-je, *puissé*-je, *parlé*-je, the acute accent is only euphonic (placed there for the sake of sound). User *de* (= to use); abuser *de* (= to abuse); but *user*, to wear out, and *abuser*, to deceive, take an accusative (no de). S'émouvoir, to move oneself, to be moved. *Ils lui feraient parler au roi.* This construction seems a violation of the rule that *faire* takes an accusative *not a dative as here* after it if the *infinitive* which follows *faire* has not an accusative after itself. If, however, any ambiguity would arise the dative must be used. Ils *la* feraient parler, would mean, *they would force her to speak.*

CHAPTER XVII.

Faire profiter à leur cause *l'apparition* (note the order). N'a rien que de vraisemblable = has nothing but (what is) probable = is probable. Voyage = journey, voyage, travel.

CHAPTER XVIII.

Une maison *in*-habitée = an *un*-inhabited house. Seize francs = seize livres: the livre = then 5 to 9 francs. Gentilshommes = noblemen, *not Gentlemen*, which is the same as in English.

CHAPTER XIX.

Dé-conseiller (*dé* in composition is a negative).

(To be continued.)

The Glass of Water; or, Cause and Effect.

(Comedy in Five Acts.)

LE VERRE D'EAU; OU, LES EFFETS ET LES CAUSES.

(Comédie en Cinq Actes.)

Scène III.	Scene III.
	Abigail.
Et pourquoi ne pas rompre avec elle...	Why not break with her?
pourquoi ne pas se soustraire à une domination insupportable?	Why not escape from such intolerable tyranny?
	Bolingbroke.
Cela, mon enfant, est plus difficile	That, child, is more difficult
à vous expliquer. Dans notre pays...	to explain to you. In our country,
en Angleterre, Masham vous le dira,	in England, Masham will tell you the same,
ce n'est pas la reine,	it is not the Queen that reigns
c'est la majorité qui règne;	but the majority;
et le parti whig, dont Marlborough est le chef,	and the Whig party, of whom Marlborough is the head,
a non-seulement pour lui l'armée,	has not only on its side the army,
mais le parlement!...	but the Parliament!
La majorité leur est acquise!	They have a majority.
et la reine Anne, dont on vante le règne glorieux,	Queen Anne, whose glorious reign they boast of,
est forcée de subir des ministres	is forced to accept ministers
qui lui déplaisent,	who are displeasing to her,
une favorite qui la tyrannise et des amis	a favourite who tyrannizes over her, and friends
qui ne l'aiment pas.	who do not love her.
Bien plus...ses intérêts de cœur,	More than that, her dearest interests,
ses désirs les plus chers	her most cherished wishes
l'obligent presque à faire la cour	almost compel her to pay court
à l'altière duchesse, car son frère,	to the haughty duchess; for her brother
le dernier des Stuarts,	the last of the Stuarts,

que la nation a banni,
ne peut être rappelé en Angleterre
que par un bill du parlement,
et ce bill, c'est encore la majorité,
c'est le parti Marlborough
qui peut seul l'appuyer
et le faire réussir...
La duchesse l'a promis...
aussi tout cède à son influence.
Surintendante de la reine,
elle ordonne, règle, décide,
nomme à tous les emplois,
et un choix fait sans son aveu excitera sa défiance,
sa jalousie, son refus peut-être.
Voilà pourquoi, mes amis, la reine
me paraît aujourd'hui bien hardie,
et la nomination d'Abigaïl bien douteuse encore !

whom the nation banished,
cannot be recalled to England
without a Bill of Parliament,
and (as to) this bill, it is the majority again,
the party of Marlborough
who alone can support it
and carry it through Parliament (pass it).
The duchess has promised it ;
therefore, everything yields to her influence.
Superintendent of the Queen's household,
she orders, regulates, decides,
appoints to all employments (posts),
and a choice made without her assent would rouse her distrust,
her jealousy, and perhaps meet with her refusal.
This is why, my friends, the Queen
appears to me very bold,
and the appointment of Abigail still very doubtful !

Abigail.

Ah ! s'il en est ainsi !...
si cela dépend seulement de la duchesse,
rassurez-vous !...j'ai quelque espoir !

Ah ! if such is the case !
If that depends on the duchess alone,
be easy, as I have yet some hopes !

Masham.

Et lequel ?

What hopes (have you) ?

Abigail.

Je suis un peu sa parente.

I am slightly related to her.

Bolingbroke.

Vous, Abigaïl ?

You, Abigail ?

Abigail.

Eh ! oui vraiment ... par mésalliance !
un cousin à elle, un Churchill,
s'était brouillé avec sa noble famille
en épousant ma mère !

Yes, of course—by misalliance,
a cousin of hers, a Churchill,
quarrelled with his noble family
when he married my mother !

Masham.

Est-il possible ?...parente de la duchesse !

Is it possible ? A relation of the duchess !

Abigail.

Parente bien éloignée...
et jamais je ne m'étais présentée devant elle,
parce qu'elle avait refusé autrefois
de recevoir et de reconnaître ma mère...
mais moi...pauvre fille...qui ne lui demanderai rien
que de ne pas me nuire...
que de ne pas s'opposer aux bontés de la reine...

A very distant one.
I never troubled her with my presence,
because she had formerly refused
to receive and acknowledge my mother.
But I (though a) poor girl, will ask her for nothing
except not to hurt me,
nor to oppose the Queen's goodness.

Bolingbroke.

Ce n'est pas une raison...
vous ne la connaissez pas...
Mais cette fois du moins je puis vous servir,
et je le ferai...dussé-je m'attirer sa haine !

That is not a reason.
You do not know her.
But this time at least I can help you,
and I will do it, even should I draw down her anger on myself.

Abigail.

Ah ! que de bontés !

Oh ! how very kind of you !

Masham.

Comment les reconnaître jamais !

How can we ever thank you !

Bolingbroke.

Par votre amitié.

By your friendship.

Abigail.

C'est bien peu !

That is very little.

Bolingbroke.

C'est beaucoup ! pour moi, homme d'état...
qui n'y crois guère...
(*Vivement*) Je crois à la vôtre et j'y compte !...
(*Leur prenant la main*) Entre nous désormais...
alliance offensive et défensive !

It is very much for me, a statesman,
who have not much faith in it.
(*Warmly*) I believe in yours and I rely upon it.
(*Taking hold of their hands*) Henceforth between us
an alliance offensive and defensive.

Abigail.

[*souriant*

Alliance redoutable !

[*smiling*

A formidable alliance !

Bolingbroke.

Plus que vous ne croyez peut-être,
et grâce au ciel, la journée sera bonne !
deux succès à emporter !... la place d'Abigaïl...
et une autre affaire qui me tient au cœur...
une lettre que je voudrais à tout prix
faire arriver ce matin entre les mains de la reine...
j'en attends et j'en cherche les moyens...
Ah ! si Abigaïl était nommée !
si elle était reçue parmi les femmes de Sa Majesté,
tous mes messages parviendraient
en dépit de la duchesse.

More formidable perhaps than you imagine,
and thank Heaven, this day will be a lucky one !
Two successes to win—a place for Abigail...
and another affair which I have much at heart
a letter which I should like at any cost
to get this morning into the Queen's hands.
I am waiting for and seeking the means (to send it).
Ah ! if Abigail only were appointed !
If she were received among the ladies of her Majesty,
all my messages would reach her (the Queen)
in spite of the Duchess.

Masham.

[*vivement.*

N'est-ce que cela ?...
je puis vous rendre ce service.

[*warmly*

Is that all ?
I can do you this service.

Bolingbroke.

Est-il possible !

Is it possible !

Masham.

Tous les matins à dix heures, et les voici bientôt,
je porte à Sa Majesté pendant son déjeûner
(*prenant le journal sur la table à droite*)

Every morning at 10 o'clock and it will soon be ten,
I take her Majesty while at her breakfast
(*taking up the newspaper from the table on the right*)

la *Gazette du monde élégant et des gens à la mode*, qu'elle parcourt en prenant son thé ; elle regarde les gravures, et parfois me dit de lui lire les articles de bals et de raouts.

the *Gazette of the fashionable world and of people à la mode*, which she skims over as she sips her tea ; she looks at the engravings and sometimes tells me to read her the articles about balls and routs.

Bolingbroke.

A merveille !...quel bonheur que la royauté lise le journal des modes... c'est le seul qu'on lui permette... (*Glissant une lettre sous la couverture du journal*) La lettre du marquis au milieu des vertugadins et des falbalas. Et pendant que nous y sommes... (*Tirant un journal de sa poche*).

Excellent ! What luck that royalty should read the *Fashionable Gazette* it is the only one allowed her. (*Slipping a letter under the cover of the journal*) The Marquis's letter in the midst of farthingales and furbelows. And while we are talking about it (*Taking a newspaper out of his pocket*).

Abigail.

Que faites-vous ?

What are you going to do ?

Bolingbroke.

Un numéro du journal *l'Examinateur* que je glisse sous la couverture. Sa Majesté verra comment l'on traite le duc et la duchesse de Marlborough... elle et toute sa cour en seront indignées... Voilà dix heures, allez, Masham...allez !

A copy of the *Examiner* which I am going to slip under the cover. Her Majesty will see how they treat the Duke and Duchess of Marlborough. She and her whole court will be indignant at it. There's ten o'clock, away with you, Masham, go !

Masham.

[*sortant par la porte à droite.*

Comptez sur moi !

[*Exit on the right.*

Trust to me.

Scène IV.

Abigail, Bolingbroke.

Scene IV.

Abigail, Bolingbroke.

Bolingbroke.

Vous le voyez ! le traité de la triple alliance produit déjà ses effets... c'est Masham qui nous protége et nous sert !

You see, the treaty of the triple alliance already produces results. Masham is our patron and serves our interests.

Abigail.

Lui ! peut-être !... mais moi qui suis si peu de chose !

He, well yes, but I am of so little use.

Bolingbroke.

Il ne faut pas mépriser les petites choses, c'est par elles qu'on arrive aux grandes !... Vous croyez peut-être, comme tout le monde, que les catastrophes politiques, les révolutions, les chutes d'empire, viennent de causes graves, profondes, importantes...Erreur !

We must not despise little things, through them we arrive at great ones.... You think, perhaps, like everyone else, that political crises, revolutions, the fall of empires, spring from serious, profound and important causes. Not at all.

Les états sont subjugués ou conduits par des héros, par des grands hommes ; mais ces grands hommes sont menés eux-mêmes par leurs passions, leurs caprices, leurs vanités ; c'est-à-dire par ce qu'il y a de plus petit et de plus misérable au monde. Vous ne savez pas qu'une fenêtre du château de Trianon, critiquée par Louis XIV. et défendue par Louvois, a fait naître la guerre qui embrase l'Europe en ce moment. C'est à la vanité blessée d'un courtisan que le royaume a dû ses désastres ; c'est à une cause plus futile encore qu'il devra peut-être son salut. Et sans aller plus loin... moi qui vous parle, moi, Henri de Saint-Jean, qui jusqu'à vingt-six ans fus regardé comme un élégant, un étourdi, un homme incapable d'occupations sérieuses... savez-vous comment tout d'un coup je devins un homme d'état, comment j'arrivai à la chambre, aux affaires, au ministère ?

States are conquered and governed by heroes and great men ; but these great men are themselves carried away by their passions, their caprices and their vanities ; that is to say, by everything that is meanest and lowest in the world. You do not know that a window in the castle of Trianon, criticised by Louis XIV., and defended by Louvois, was the cause of the war which is now setting Europe in flames. It is to the wounded vanity of a courtier that the kingdom owes its misfortunes ; it is to a still more trifling cause that it will owe perhaps its safety. And without going any further, I who now speak to you, I, Henri de St. Jean, who until I was six and twenty years old, was looked upon as a fashionable gentleman, a thoughtless fellow, a man incapable of serious work— do you know how all at once I became a statesman, how I became a member of the House of Commons, how I received a high appointment and became a Minister ?

Abigail.

Non vraiment.

Not at all.

Bolingbroke.

Eh bien ! ma chère enfant, je devins ministre parce que je savais danser la sarabande ; et je perdis le pouvoir parce que j'étais enrhumé.

Well, my dear child, I became a Minister because I knew how to dance the sarabande ; and I lost power because I caught a cold.

Abigail.

Est-il possible ?

Is it possible ?

Bolingbroke.

[*regardant du côté de l'appartement de la reine.*

Je vous conterai cela un autre jour, quand nous aurons le temps. Et maintenant, sans me laisser abattre, je combats à mon poste, dans les rangs des vaincus !...

[*looking towards the Queen's apartment.*

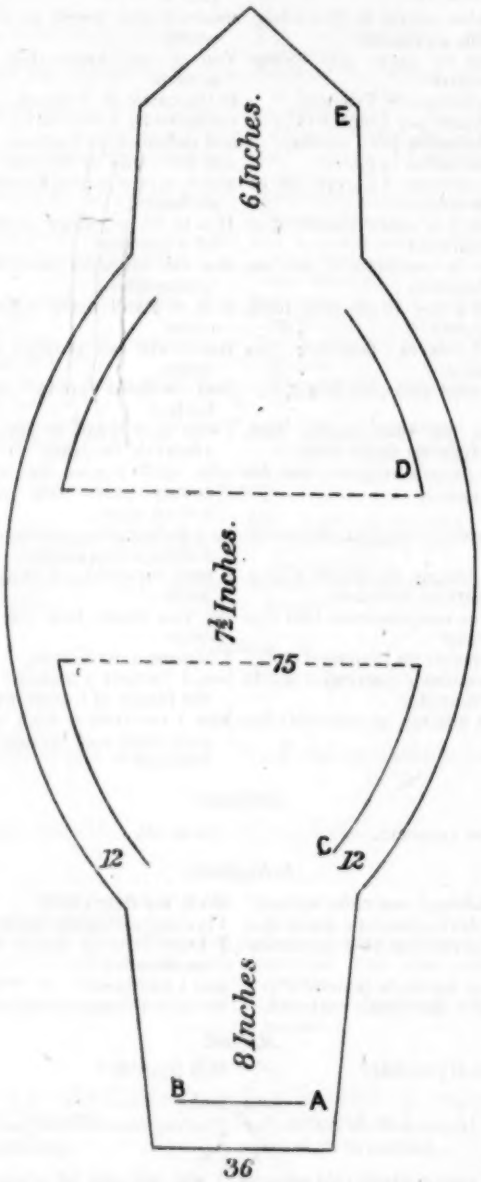
I will tell you all about it some day, when we have time. And now, without allowing myself to be discouraged, I am fighting at my post in the ranks of the vanquished.

(To be continued.)

Knitting Maps.

BY MRS. J. D. HARRIS.

LADY'S BELT.



2 Bone pins. No. 11 Chamber's bell gauge.
3 skeins knitting cotton. No. 3. 3 thread.

Cast on 36 stitches. Knit 1 inch.

To form the Slit.

A. Knit 6. Cast off all but the 6 last.

B. In the reverse row, knit 6. Cast on 24. Knit 8 inches plain.

To increase.

C. Knit 12. Make a stitch, by picking up a loop. Knit to within 12 of the end. Make another stitch. Knit 12.
The reverse row plain knitting.
Continue these increasings till you have 75 stitches.
Knit 7½ inches plain, or longer if required.

To decrease.

D. Knit 12. Knit 2 together. Knit to within 14 of the end. Knit 2 together.
The reverse row plain knitting.
Decrease till you have 36 stitches left. Knit 6 inches.

E. Slip the first stitch. Knit the 2 next together at the beginning of every row till you have only 3 stitches left.
Slip 1. Knit 2 together, pull the slipped stitch over.
Sew a tape to each end.

Pupil Teacher Examination Papers. (Scotland.)

28TH APRIL, 1888.

END OF FIRST YEAR.

Needlework.

Gather 6 inches of material and set it into a stitched band (3 inches).
Show two ways of sewing on a tape.

Latin.

1. Decline together *pulchra virgo* and *eadem facies*.
2. Under what circumstances does the ablative of the third declension end in *i*. Give examples.
3. Write out the future indicative active of *rego*, and the imperfect subjunctive passive of *audio*. Give the English of *amandus, docturus, rectum iri, auditu*.
4. Translate into English and parse the words in *italics*:—
   (*a.*) Romulus *urbem* Romam *vocat*.
   (*b.*) Amicus meus in *ea domo* habitat, *quam* frater tuus *ædificavit*.

OPTIONAL.

Translate into Latin:—
(*a.*) The Consul himself was wounded.
(*b.*) The King praised the soldiers, because they fought very bravely.

LATIN.

	SING.	PLUR.
(1) N.	Pulchra virgo	pulchræ virgines
G.	Pulchræ virginis	pulchrarum virginum
D.	Pulchræ virgini	pulchris virginibus
Acc.	Pulchram virginem	pulchras virgines
V.	Pulchra virgo	pulchræ virgines
Abl.	Pulchra virgine	pulchris virginibus
N.	Eadem facies	eaedem facies
G.	Ejusdem faciei	
D.	Eidem faciei	
Acc.	Eandem faciem	easdem facies
Abl.	Eâdem facie	

(2) Nouns which have their stems in *i* might form the ablative in *i*, but such is the case only—1. With those which make the accusative in *im*. 2. With the neuter nouns in *e, al*, and *ar*. 3. With all adjectives in *-is, -is, -e*, and *-er -is -e*; as, *amussi, ravi, siti*; *mari, vectigali, calcari*; *miti, acri*.

(3)

	Future Indic. Act.		Imperfect Subj. Passive.	
	SING.	PLUR.	SING.	PLUR.
1.	Regam	regemus	Audirer	audiremur
2.	Reges	regetis	Audireris	audiremini
3.	Reget	regent	Audiretur	audirentur

ENGLISH.

Amandus—to be loved, deserving or requiring to be loved.
Docturus—being about to be taught.
Rectum iri—to be about to be ruled.
Auditu—to be heard.

TRANSLATION.

(4) (*a*) Romulus calls the city 'Rome.'
(*b*) My friend lives in that house, which thy brother built.

PARSING.

Urbem—acc., sing., fem., noun, 3rd decl., 'urbs -is' gov. by 'vocat.'
vocat—reg., trans. verb, 1st conj., act., indic., pres., 3rd pers., sing., agr. with 'Romulus' (*voco -avi -atum -are.*)
ea—abl., sing., fem., demonst. adj. *is, ea, id*, qual. 'domo.'
domo—abl., sing., fem., noun, partly 4th and partly 2nd decl., *domus, domûs* (*domi* is a locative, meaning 'at home').
quam—acc., sing,, fem., anteced. 'domo,' rel. pron. *qui, quae, quod*, gov. by 'ædificavit.'
ædificavit—reg., trans. verb, 1st conj., *ædifico -avi -atum are*, indic., pret., 3rd pers., sing., agr. with 'frater.'

END OF SECOND YEAR.

FIRST PAPER.

Two hours and a half allowed for this Paper.

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word 'Acknowledgment.'
Write in small hand, as a specimen of copy-setting, the sentence 'Kind hearts are more than coronets.'

Arithmetic.

MALES.

1. For what time was £312 10s. invested in 2¾ per cent. when it amounted to £331 8s. 1½d. ?

£312 10s.	:	£100	:: 1 yr. : time.
or		or	
6250s.	:	2000s.	
£2 15s.	:	£181 8s. 1½d.	
or		or	
1320 halfd.	:	9075 halfd.	

$$\frac{1 \text{ yr.} \times 2000 \times 9075}{6250 \times 1320} = \underline{2\tfrac{1}{2} \text{ yrs.}} \text{ Ans.}$$

2. £2,350 was invested in the Three-and-a-Half per Cents. at 94; by-and-bye the price fell to 90, and then I sold out and bought house property which yielded me my original income; what per centage did I get from the property ?

(*a*) £94 : £2350 :: £3½ : 1st income.

$$\frac{£7 \times 2350}{2 \times 94} = £87\ 10\text{s.}$$

(*b*) 94 : 90 :: £2350 : sum realised.

$$\frac{£2350 \times 90}{94} = £2{,}250.$$

(*c*) £2,250 : £100 :: £87·5 : per centage from property.

$$\frac{£87{\cdot}5 \times 100}{2250} = \underline{3\tfrac{8}{9}}. \text{ Ans.}$$

3. A cargo of coals, weighing 96 tons, and sold for £42 11s., realised a profit at the rate of 6⅔ per cent.; find the prime cost.

£106⅔ : £100 :: £42 11s. : prime cost.

$$\frac{£42\ 11\text{s.} \times 100 \times 8}{851} = \frac{851\text{s.} \times 800}{851}$$

$$= 800\text{s.} = \underline{£40}. \text{ Ans.}$$

FEMALES.

1. Find the value of (⅜ of 4½ + ½) of 5 fur. 20 po., and (⅝ of 2⅖) of £3 0s. 6d.

(*a*) (⅜ of 4½ + ½) of 5 fur. 20 po. $= \left(\frac{3 \times 25}{5 \times 6} + \frac{1}{2}\right)$ of 220 po.

$= (2\frac{5}{10} + \frac{5}{10})$ of 220 po.
$= \frac{8}{10}$ of 220 po.
$= 594$ po. $=$
$\underline{1 \text{ m. } 6 \text{ fur. } 34 \text{ po.}}$ Ans.

(*b*) (⅝ of 2⅖) of £3 0s. 6d. $= \frac{3 \times 11}{5 \times 4}$ of 60½s.

$$= \frac{121\text{s.} \times 33}{2 \times 20}$$

$$= \frac{3993\text{s.}}{40} = \underline{£4\ 19\text{s. } 9\tfrac{9}{10}\text{d.}} \text{ Ans.}$$

2. Reduce to decimals ⅜, 1⅔, $\frac{6}{7}$, $\frac{4}{1000}$ and $\frac{134}{9000}$.

$\frac{3}{8} = \frac{3{\cdot}0}{5} = \underline{{\cdot}6}$. Ans.

$1\frac{2}{3} = \frac{2{\cdot}0}{3} = \underline{{\cdot}\dot{6}}$. Ans.

$\frac{6}{7} = \frac{{\cdot}6}{7} = \underline{{\cdot}0857142}$. Ans.

$\frac{4}{1000} = \underline{{\cdot}004}$. Ans.

$\frac{134}{9000} = \frac{{\cdot}134}{9} = \underline{{\cdot}0148}$. Ans.

3. How many revolutions should a wheel 1⅓ in. in circumference make in a journey of half a mile?

Half a mile = 2640 ft. = 31680 in.

Revolutions = 31680 ÷ 1⅓ in. $= \frac{31680 \times 6}{11}$

$$= \frac{190080}{11} = \underline{17280}. \text{ Ans.}$$

4. Divide sixty shillings among 19 boys and 13 girls so that a boy may have one-third more than a girl.

13 girls get 13 shares
19 boys get 25⅓ ,,
Total shares = 38⅓

∴ A girl's share $= \frac{60\text{s.}}{38\frac{1}{3}} = \frac{180\text{s.}}{115} = \underline{1\text{s. } 6\frac{5}{23}\text{d.}}$ Ans.

and a boy's = 1s. $6\frac{5}{23}$d. × 1⅓ = $\underline{2\text{s. } 1\frac{13}{23}\text{d.}}$ Ans.

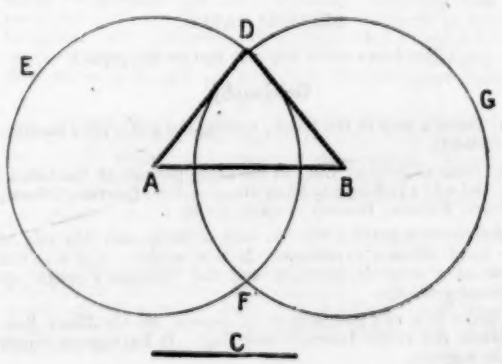
Euclid.

(Book-work well done will get the mark 'G.')

1. Define *point, straight line*, and *superficies*.
A *point* has position but not magnitude.
A *straight line* is that which lies evenly between its extreme points; or a *straight line* is the shortest distance between two points.
A *superficies* or surface is that which has length and breadth.

2. To describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given rectilineal angle. Euclid, Bk. I., Prop. 45.

3. On a given line describe an isosceles triangle with sides equal to a given straight line. What is the condition implied ?



Let AB be the given base and C the straight line, to which the sides are to be equal. [*The condition implied is that C must be greater than half the base.* (I. 20.).]

From the centre A. with a radius equal to C, describe the circle DEF, and from the centre B, with the same radius, describe the circle DGF.

Then from the point D, where the circles cut one another (for they will cut one another because the radius of each is greater than half the line AB), draw DA, DB to the points A and B, the extremities of the given base.

Now because A is the centre of the circle DEF, whose radius is equal to C, then AD is equal to C. For the same reason BD is equal to C. Wherefore an isosceles triangle ADB has been constructed on the given base AB, and with sides equal to C.

Q.E.F.

Grammar.

'Of Nelson and the North
Sing the glorious day's renown,
When to battle *fierce* came forth
All the *might* of Denmark's crown,
And her arms along the *deep* proudly shone;
By each gun the lighted *brand*
In a bold determined hand,
And the Prince of all the land
Led them *on*.'

1. Give a general analysis of the above passage.

2. Parse fully the words printed in italics.

GENERAL ANALYSIS.

A. Of Nelson and the North sing the glorious day's renown. (*Principal sentence*).

a 1. When to battle fierce came forth all the might of Denmark's crown. (Subord. adj. sent. of time to A.)

a 2. (and) (when) her arms along the deep proudly shone. (Subord. adj. sent. of time to A.)

B. By each gun (was) a lighted brand in a bold determined hand. (Principal sent.)

C. (and) the Prince of all the land led them on. (*Principal sent. in copulative co.-ord. with B.*)

PARSING.

Sing—irreg. trans. verb, *sing, sang, sung*, imper., pres., 2nd pers., subj. understood.
fierce—adj. qual. 'battle.' (It might be adv. too, mod. 'came').
might—abstr. noun, neut., sing., nom., subj. of 'came').
deep—abstr. noun, neut., sing., obj., gov. by 'along.'
brand—com. noun, neut., sing., nom., subj. of 'was.'
on—adv. of manner, mod. 'led,'

3. Give examples to illustrate (*a*) the omission of the antecedent (*b*) the omission of the relative pronoun.

(*a*) 1. Who steals my purse steals trash.
2. You may tell whom you will.
3. How shall I curse whom God hath not cursed?

(*b*) 1. I know the tale you told.
2. Æneas left Troy the very night it was taken.
3. In this 'tis God directs, in that 'tis man.

SECOND PAPER.

(*Two hours and a half allowed for this paper.*)

Geography.

1. Draw a map of the Baltic, naming the gulfs, river mouths, and islands.

2. State as fully as you can the exact position of the following, and add anything you know about each:—Palermo, Odessa, Lahore, Elsinore, Benares, Sophia, Delhi.

Palermo is situated on the N. coast of Sicily, and has one of the finest climates in Europe. It is a seaport, and was the scene of a dreadful massacre call the 'Sicilian Vespers' six hundred years ago.

Odessa is a city and seaport of Russia, on the Black Sea, between the rivers Dniester and Bug. It has a great export trade in grain.

Lahore, the capital of the Punjaub, near the left bank of the Ravee, on the highway from Delhi to Kabul. It contains many temples and magnificent buildings.

Elsinore is a seaport of Denmark, on the island of Zealand, to the north of Copenhagen, on the narrowest part of the Sound. Vessels used to pay toll to the King of Denmark in order to pass this place.

Benares is a famous city of British India, capital of a division of the same name, and stands on the north bank of the Ganges. It is the chief seat of Brahminical learning.

Sophia, on the Isker, in Bulgaria, manufactures woollen and silk goods, leather and tobacco, and has considerable trade.

Delhi, the chief city of the division of the same name, and long capital of the Mogul Empire, stands on the Jumna. It is very strongly fortified, has an excellent college, and in 1857 it was taken by the British from the insurgent sepoys, by whom it had been seized in the beginning of that year.

3. How would you explain this sentence to a class?—The ship was last spoken in lat. 20° S., long. 10° W.

Taking a terrestial globe, or a map of the world, I would explain terms latitude and longitude. The former being a name denoting the distance of a place counted in degrees, minutes, and seconds, north or south of the Equator, the latter a name denoting similarly the distance of a place east or west of the first meridian which for this country passes through Greenwich Observatory. After ensuring myself that the class has got a clear idea of these, I would find a point on the Equator 10° west of Greenwich, and, running along the line southwards, stop at the parallel of latitude 20° from the Equator, and show that the point where these lines meet is the very spot required.

History.

(*Answer any two of the following questions.*)

1. State the claims of William the Conqueror to the throne of England; and tell what you know of the Feudal System he instituted, and of the Saxon land tenure it displaced. Explain the terms Domesday Book and Curfew Bell.

William the Conqueror founded his claim to the throne of England on the purpose, if not the testament of, Edward the Confessor, and on the oath which Harold had made to promote the Duke's succession to it. The Feudal System was the tenure of land by military service. All lands belonged in the first instance to the King, and were by him apportioned to his vassals, and in turn let by them to sub-vassals or retainers. This system, though in vogue in Saxon times, was the distinctive feature of the Norman period. The feudal tenure of lands still exists, in theory at least, all land in England being held directly or indirectly from the Crown. *Folkland* was the land of the folc, or people, in Saxon England. The Folcland was that portion of the kingdom which was retained in behalf of the public, and with a view to increasing population, and the growing wants of the community—was not permitted to become allodial estate or absolute private property. The holder of folcland paid rent for his lands, and could be dispossessed at will.

Domesday Book is the record of a survey made by William the Conqueror. It consists of two volumes, and contains the names of every town and village, the names of estates, their value, size, owners, and other information.

Curfew Bell was a bell tolled in Norman England as a signal to extinguish all fires and lights.

2. State the names of the various Scottish sovereigns that suffered imprisonment in England during the period 1066—1603, with the circumstances, places, and dates of imprisonment.

William the Lion, who had supported the sons of Henry II. of England in their rebellion against their father, was taken prisoner at Alnwick Castle, 1174, and regained his liberty only on condition of becoming liegeman of Henry for his territories.

At Nevil's Cross, 1346, Philippa defeated and took prisoner David II. of Scotland, who was committed to the Tower after being led through the streets of London. He was detained a prisoner for eleven years.

James I. of Scotland was taken prisoner off Flamborough Head by an English ship, as he was being conveyed to France (1406). He was kept a prisoner in London for eighteen years, but received an excellent education.

When Mary Queen of Scots took refuge in England (1568) Elizabeth detained her a prisoner, and she was ordered from castle to castle, till, finally confined in Fotheringay, she was beheaded there in 1587, after an imprisonment of eighteen years.

3. State what you know of Simnel and Warbeck.

In the reign of Henry VII. a youth appeared, asserting himself to be the Earl of Warwick, son of George, Duke of Clarence. He was crowned king in Ireland, but on landing in England his little army was overthrown at Stoke-upon-Trent, 1487. The pretended earl, who was one Lambert Simnel, son of an Oxford joiner, was captured and treated with contemptuous mercy, Henry making him scullion in his kitchen.

Perkin Warbeck claimed the throne in the same reign, as being the duke of York who was said to have been murdered in the tower with Edward V. by their uncle Richard. He invaded England and besieged Exeter, but his army being dispersed he took refuge in Beaulieu Abbey. Being drawn from it by a promise of pardon he was executed as a traitor, 1499.

4. Give some account of Henry Eighth's attack on the monasteries.

After the fall of Wolsey his power was conferred upon Thomas Cromwell, who became Henry's Vicegerent in ecclesiastical matters, and as during his administration all the monastic foundations were destroyed, he has been called 'The Hammer of the Monks.'

In 1536 an Act of Parliament dissolved the smaller monasteries and their revenues were given to the king. The north-country people broke out in a revolt called the 'Pilgrimage of Grace' which was easily quelled; and then followed the destruction of the larger houses. Abbots and priors were made to surrender them as of free will to the king, and an Act was passed, 1539, confirming these and future surrenders. Of the vast wealth thus thrown into Henry's hands, part went to found new bishoprics, and part to fortify the coast, but most went in lavish grants to courtiers, whilst many abbeys were pulled down for the sake of their stone and lead.

Composition.

Write notes of a lesson on 'Fuel' or 'Birds' Nests.'

FUEL.

Things to be seen.—Fuel, pieces of wood, charcoal, peat, coal, patent fuel, coke.

Definition.—Fuel consists of such combustibles commonly used for fires or furnaces, such as coal, wood, turf, &c., which differ in value according to their power of giving out heat.

Kinds of Fuel.—Wood—originally used by man; best known to him in early stages of civilization; different kinds give out heat according to dryness and weight. Newly felled wood contains large quantities of sap and moisture, therefore less valuable for fuel than dry well-seasoned wood. *Charcoal (manufacture to be described)*—used where smoke cannot be tolerated; dangerous to health (*why*). *Peat*—remains of dead plants (*describe bog and method of cutting and drying peat*), sometimes called 'turf.' Turf, properly, upper layer of a field containing roots of living plants; peat does not give so much heat as the same weight of coal. *Coal*—Advert to coal fire; question on coal-mining; coal-field; collier; immense coal wealth of England; coal the most commonly used fuel of civilized countries when obtainable; heating power greater than charcoal. *Patent Fuels*—made from coal-dross mixed with tar, pitch, sawdust, &c.; made in great quantities in Scotland by Messrs. Wm. Baird and Coy.; called briquettes; very handy for all kinds of fires. *Gas*—Often takes the place of fuel.

Latin.

1. Go through the present indicative and subjunctive of *prosum*, *nolo*, and *malo*.

2. Give the participles of *eo*, and the imperatives and infinitives of *fio* and *nolo*.

3. Distinguish the use of *nostrum* and *nostri*, and express in Latin: the one, the other, some, others, the former, the latter.

4. Translate, parsing, with syntax, the words in italics:—
(*a.*) Amicum *fallere turpissimum* est.
(*b.*) Non idoneus fuit, *qui exercitui praesset.*

5. Translate into Latin:—
(*a.*) We know that Hannibal was conquered by Scipio.
(*b.*) He arrived before the ambassadors departed.

	Present Indicative		Present Subjunctive	
	Sing.	*Plural*	*Sing.*	*Plural*
1.	prosum	prosumus	prosim	prosimus
2.	prodes	prodestis	prosis	prositis
3.	prodest	prosunt	prosit	prosint
1.	nolo	nolumus	nolim	nolimus
2.	nonvis	nonvultus	nolis	nolitis
3.	nonvult	nolunt	nolit	nolint
1.	malo	malumus	malim	malimus
2.	mavultis	mavultis	malis	malitis
3.	mavult	malunt	malit	malint

2. Participles of *eo*—Pres., iens, euntis. Fut., iturus-a-um.
Infinitives—Pres., fieri. Fut., factum iri. Perf., factum iri.
,, nolle. —— ,, noluisse.

3. (*a*) *Nostrum* is used only in a partitive sense, as *multi nostrum*, many of us; whereas *nostri* is the regular genitive, as *memor est nostri*, he is mindful of us.
(*b*) The one, *alter*; some, alii; the other, alter; others, alii the former, ille prior; the latter, hic posterior.

4. Translation into English:—
(*a*) To deceive a friend is very mean.
(*b*) There was not a fit man to command the army.

PARSING.

Fallere—irreg. trans. verb, act., *fallo, fefelli, falsum, fallere*, 3rd. conj., inf., pres., here gerundial.
turpissimum—adj., 1st. and 2nd. conj., *turpissimus-a-um*, superl. deg. of turpis-ior-issimus, neut., nom., predic. of 'fallere amicum.'
qui—rel. pron., *qui, quae, quod*, anteced. 'idoneus,' nom., mas., subj. of 'praesset.'
exercitui—com. noun, mas., 4th decl., *exercitus-ûs*, sing., dat., gov. by 'praesset.'
praesset—irreg. verb, *praesum-fui-esse*, subj., imperf., 3rd pers., sing., agr. with 'qui.'

5. Translation into Latin:—
(*a*) Scimus Hannibalem a Scipione victum esse.
(*b*) Advenit priusquam legati discesserant.

Teaching.

1. What faults in reading are common among young scholars, and how would you correct them?

2. State the proper way of holding the pen in writing. What is this intended to secure? Why should the use of short pencils be avoided?

1. The faults in reading, common among young scholars, are errors of pronunciation affecting the sounds of single words, neglecting the phrases, and shouting, or its opposite. Errors in pronunciation should be corrected at once, and the attention of the whole class called to the errors made, the young reader being interrupted for the purpose. This mode should be employed till the class is able to read easy narrative freely. Bad phrasing begins with narrative reading and this can only be avoided by pattern on the teacher's part, and showing how words are grouped together in meaning. Shouting may be toned down by pattern giving, requesting the pupil to read as he speaks; and reading in too low a voice may be cured by the teacher standing well back from the class, and encouraging the little one to speak well out, so as to be heard at a good distance.

2. The pen should be held between the thumb (bent) and the first two fingers; the first finger on the pen, and the edge of the middle finger just supporting and keeping the pen in position. The pen must be kept in a sloping position, passing between the second joint and knuckle of the first finger, and pointing up towards the right ear.

This secures a less laborious style of writing, great facility in using the pen, and is less fatiguing than other methods.

Short Pencils should be avoided as teaching a bad style of holding the pen; the pupil being forced to hold these short pencils only between the thumb and forefinger, so that when he comes to write with a pen he naturally thinks that he should follow up his usual style.

END OF THIRD YEAR.

FIRST PAPER.

(Two hours and a half allowed.)

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word 'Acknowledgment.'

Write, in small hand, as a specimen of copy-setting, the sentence 'Kind hearts are more than coronets.'

Arithmetic.

MALES.

(*Solve* any two *of the following questions.*)

1. What is the average attendance in each of the two following schools:—(*a*) a school of 1,230 pupils and 12½ per cent. absent; (*b*) a school of 560 pupils with a daily average of 69 absentees? Calculate the percentage of absenteeism in the latter.

(*a*) 100 : 87½ :: 1230 pupils : aver. att.

$$\frac{1230 \text{ pupils} \times 87\frac{1}{2}}{100} = \underline{1076{\cdot}25} \text{ pupils. Ans.}$$

(*b*) (1) 560 − 69 = 491 daily average. Ans.

(2) 560 : 69 :: 100 : percentage of absentees.

$$\frac{100 \times 69}{560} = \frac{6900}{560} = \underline{12\tfrac{5}{7}} \text{ Ans.}$$

2. How much must I invest in the 3½ per cents. at 99¾ to realise an income of £350 a year?

3½ : 350 :: £99¾ : sum required.

$$\frac{£99\tfrac{3}{4} \times 350}{3\tfrac{1}{2}} = \frac{399 \times 350}{14} = \underline{£9975.} \text{ Ans.}$$

3. Find the square root of 34850.

	34,85,0(186·41.	Ans.
1 × 1 =	1	
	248	
28 × 8 =	224	
	2450	
366 × 6 =	2196	
	15400	
3724 × 4 =	14896	
	50400	
37241 × 1 =	37241	

FEMALES.

1. Add by decimals $\frac{3}{1000}$, ⅛, $6\frac{3}{47}$, ¼, $3\frac{1}{18}$, and 23.

$\frac{3}{1000}$	= ·003		
⅛	= ·8		
$6\frac{3}{47}$	= 6·074	074074	0
¼	= ·285	714285	7
$3\frac{1}{18}$	= 3·185	555555	5
	23·		
	33·318	343915	

2. £1875·825 was the price paid for $\frac{9}{10}$ share of a farm; by-and bye, when the value of the whole farm had fallen by £1440, what should be paid for ·7 of it?

(2) (*a*) Value of the whole farm = £1875·825 × $\frac{10}{9}$,
= £6252·75.

(*b*) Price of ·7 when the value has fallen by £1440 =

$$£6252{\cdot}75 - £1440 \times \tfrac{7}{9} = \frac{£4812{\cdot}75 \times 7}{9}$$

$$= \frac{£33689{\cdot}25}{9}$$

$$= \underline{£3743\ 5s.} \text{ Ans.}$$

3. If building ground be bought for 15s. 9d. per square yard, what will be the cost of half an acre?

Half an acre = 2420 sq. yds.

	£	s.		
	2420	0	=	value at £1.
10s. = ½ of £1	1210	0	=	,, ,, 10s.
5s. = ½ of 10s.	605	0	=	,, ,, 5s.
6d. = $\frac{1}{10}$ of 5s.	60	10	=	,, ,, 6d.
3d. = ½ of 6d.	30	5	=	,, ,, 3d.
	£1905	15	=	,, ,, 15s. 9d. Ans.

4. A bankrupt's debts are £1290; he pays one dividend, 10s. 8d. in the £, and by-and-bye another, at the rate of 7s. 6d. in the £, of what he is *still owing;* find the loss per £ to the creditors.

(*a*) By paying 10s. 8d. in the £ he still owes 9s. 4d. in the £.

(*b*) By paying 7s. 6d. in the £ he pays $\frac{150}{240}$ or ⅝ of the 9s. 4d. still owing in the £.

(*c*) ⅝ of 9s. 4d. = 3s. 6d.; he therefore owes (9s. 4d. — 3s. 6d.), or 5s. 10d. is the loss to the creditors.

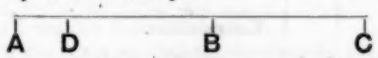
Euclid.

(*Book work well done will get the mark 'G.'*)

1. If a straight line be bisected, and produced to any point, the square on the whole line thus produced, and the square on the part of it produced, are together double of the square on half the line bisected and of the square on the line made up of the half and the part produced.

Euclid, Book II. Prop. 10.

2. Divide a given straight line into two parts, such that the squares of the whole line and one of the parts shall be equal to twice the square of the other part.



Let AB be the given line. Produce AB to C, making AC so that the square upon it shall be equal to three times the square upon AB. From BA cut off BD equal to BC, then the squares upon AB and BD shall be double of the square upon BD. (*We may say that CD is bisected in B, and produced to A.*)

∴ (II. 10) the squares upon AC and AD are equal to twice the square upon BD and twice the square upon AB. But the square upon AC = three times the square upon AB. ∴ three times the square upon AB, together with the square upon AD, are equal to twice the square upon AB and twice the square upon BD. Take away twice the square upon AB from each of these equals, and the square upon AB, together with the square upon AD, is equal to twice the square upon BD. Therefore AB is divided in D, so that the squares, &c. Q.E.F.

Algebra.

(*Solve* any three *of the following questions.*)

1. State the rule for finding the G.C.M. of two algebraical quantities, and find the G.C.M. of

$$2x^4 - 7x^3 + 12x^2 - 11x + 3 \text{ and } x^3 - x^2 + 5x^2 - 2x.$$

Let A and B represent the two expressions; arrange them according to descending powers of some common letter, and suppose the index of the highest power of that letter in A not less than the highest power of that letter in B. Divide A by B; then make the remainder a divisor and B the dividend. Again make the new remainder the divisor and the preceding divisor the dividend. Proceed in this way till there is no remainder; then the last divisor is the G.C.M.

$$\begin{array}{r|l} 2x^4 - 7x^3 + 12x^2 - 11x + 3 & x^3 - x^2 + 5x^2 - 2x \\ & \quad 2 \\ \hline & 2x^3 \quad - 2x^2 + 10x^2 - 4x \\ & 2x^3 - 7x^4 + 12x^3 - 11x^2 + 3x \\ \hline & 7x) \; 7x^4 - 14x^3 + 21x^2 - 7x \\ & \quad x^3 - 2x^2 + 3x - 1 \end{array}$$

$$\begin{array}{r|l} x^3 - 2x^2 + 3x - 1 & 2x^4 - 7x^3 + 12x^2 - 11x + 3 \; (2x - 3 \\ & 2x^4 - 4x^3 + 6x^2 - 2x \\ \hline & - 3x^3 + 6x^2 - 9x + 3 \\ & - 3x^3 + 6x^3 - 9x + 3 \\ \hline \end{array}$$

$$\therefore \underline{x^3 - 2x^2 + 3x - 1} = \text{G.C.M.}$$

2. Find x from the following equation :—

$$a(x-b)(x-c) - b(x-a)(x-c) - (a-b)(x-a)(x-b) = 0$$

$$a(x-b)(x-c) - b(x-a)(x-c) - (a-b)(x-a)(x-b) = 0$$

$$ax^2 - abx - acx + abc - bx^2 + abx + bcx - abc - ax^2 + bx^2 + a^2x - abx + abx - b^2x - a^2b + ab^2 = 0$$

After collecting, $acx + bcx + a^2x - b^2x - a^2b + ab^2 = 0$

Transposing, $a^2x - acx + bcx - b^2x = a^2b - ab^2$

$$x(a^2 - ac + bc - b^2) = ab(a-b)$$

$$x(a + b - c) = ab$$

$$x = \frac{ab}{a+b-c}$$ Ans.

3. A ship's crew have provisions for 100 days. They pick up a shipwrecked crew of 20 men, in consequence of which the provisions will last for only 60 days. What was the crew?

Let x = number of crew

Then $x : x + 20 :: 60 : 100$

Or $100x = 60x + 1200$

$100x - 60x = 1200$

$40x = 1200$

$x = 30$ number of crew. Ans.

4. Find the area of an isosceles triangle of which each of the equal sides is 7 ft. 1 in. and the base 6 ft.

Perp. height $= \sqrt{85^2 \text{ in.} - 36^2 \text{ in.}}$

" " $= \sqrt{7225 - 1296}$

" " $= \sqrt{5929}$

" " $= 77 \text{ in.} = 6\frac{5}{12}$

Area $= \frac{6 \text{ ft.} \times 6\frac{5}{12}}{2} = 10\frac{1}{2}$ sq. ft. Ans.

Grammar.

Spur on thy *way!—since* now *thine* ear
Has brook'd thy veterans' wish to hear,
Who, as thy flight they eyed,
Exclaim'd,—while tears of anguish came,
Wrung forth by pride, and rage, and shame,—
'*O*, that he had *but* died!'

1. Give a general analysis of the above passage.

2. Parse the words in *italics*.

ANALYSIS.

A. 'Spur on thy way.'—*Principal sentence.*

a_1. 'Since now thine ear has brooked thy veterans' wish to hear.'—*Subord. adv. clause. to A.*

a_2. 'Who exclaimed, "O, that he had but died."'—*Subord. adj. sent to* a_1.

a_3. 'While tears of anguish came, wrung forth by pride, and rage, and shame.'—*Subord. adv. sent. to* a_2.

a_4. 'O, that he had but died.'—*Subord. noun sent. to* a_2.

PARSING.

Spur—Reg., intran., verb. imper., pres. 2nd pers. agr. with (thou).
on—Prep., relating 'spur' and 'way.'
way—Com. noun, neut., sing., obj., gov. by 'on.'
since—Subord. conj. of condition, introd., subord. adv. sent.
thine—(=thy) pronoun, poss., adj., qual. 'ear.'
wrung—Complete part of irreg. trans. verb, *wring, wrung, wrung*, qual. 'tears.'
forth—Adv., 'motion from' mod. 'wrung.'
O—interjection, 'grief.'
but—Adv., mod., 'died.'

3. What is an Interjection? Do Interjections govern cases? if so, give examples.

An interjection is a word which expresses any sudden wish or emotion of the mind, but it does not express a definite idea.

Interjections can scarcely be said to govern a case, but some of them are followed by an object; as, Ah me! Oh dear me! but this occurs only with the first person.

4. What Latin prefixes occur in the following words :—*ambiguous, effect, oppose, redeem, uniform*? Give their meaning.

WORD	PREFIX	MEANING
ambiguous	ambi=ambo	both
effect	ef=ex	out of
oppose	op=ob	against
redeem	red=re	again
uniform	uni=unus	one

SECOND PAPER.

(*Two hours and a half allowed for this paper.*)

Geography.

1. Draw a map of the north coast of Africa and of the countries bordering on it. Show the physical features.

2. Describe the physical features and name the productions of Cape Colony.

(2) In the southern and more populous part of the colony the rise from the coast to the interior takes place in well marked terraces, the edges of which, facing seawards, present the appearance of mountains on the outside. The innermost terrace is bounded on the south by a true mountain range with peaks of from 5,000 to 6,000 feet in height, but the table-lands on either side are 3,000 feet in height or more. These table-lands are called Karroos, and that which lies to the south of the mountain range just mentioned is in most parts at least seventy miles in breadth, and is known as the Great Karroo. The general slope of the Karroos is towards the interior, but outside of the inner mountain range the rivers nevertheless all flow directly seawards, and break through the edges of the table-lands in deep gorges called Kloofs.

The chief productions are wool, diamonds, ostrich-feathers, wine, copper, gold, and heaths.

3. Give the situation of the following places :—Tunis, Lake Ngami, Muscat, Khiva, Lake Baikal, Bangkok, Nankin, Sierra Leone.

Tunis is in North Africa on the west side of a lagoon, and within ten miles of ancient Carthage.

Lake Ngami is in the basin of the Zambesi north of the Kalihari Desert in South Africa.

Muscat is situated in the east corner of Arabia near the entrance of the Persian Gulf.

Khiva is in Western Turkestan near the Oxus.

Lake Baikal lies in Eastern Siberia on the River Lena.

Bangkok stands on the Menam in Siam.

Nankin stands on the Yang-tse-kiang in China and communicates with Pekin by means of the Grand Canal.

Sierra Leone in West Africa is watered by the Rokelle or Sierra Leone River.

History.

(Answer *any two* of the following questions.)

1. Describe the Porteous Riots.

The Porteous Riots took place in 1736. A mob in Edinburgh, roused to madness by the execution of a smuggler named Wilson who had magnanimously assisted a fellow prisoner to escape, attacked the hangman and the soldiers. Captain Porteous, of the City Guard, ordered his men to fire upon the crowd and several people were killed. For this rash act he was condemned to death, but a reprieve was obtained, and it was immediately reported that a pardon would follow. The rioters, not to be baulked of their prey, broke open the jail and hanged the captain on a dyer's pole. The government, enraged at this, brought in a bill to demolish the walls of Edinburgh and take away the charter of the city, but so strongly was the measure opposed by the Scottish members that it had to be abandoned.

2. What do you know of the attempts of the first two Stuarts to establish Episcopacy in Scotland?

In 1617, when on a visit to Scotland, James I. tried to make the Church of Scotland less different from the Church of England. For this purpose he proclaimed that public worship

should be held on Christmas Day, Good Friday, Easter, Ascension Day, and Whitsunday; and in a General Assembly, held at Perth (1618), he got what are known as the *Five Articles of Perth* passed, all with the same end in view. This was greatly against the wishes of the Scotch, and James prudently took care not to go too far.

In 1633 Charles visited Scotland and was crowned at Holyrood. It was soon seen that the English form of religion was to be forced on Scotland with more determination than ever, especially when Laud became Archbishop. A prayer-book was at this time in use in Scotland, and in 1637 an attempt was made to do away with it, and to impose, instead, a prayer-book prepared by Laud, similar to that of the Church of England. The introduction of the new book was fiercely opposed. When it was first used in Edinburgh a riot took place in St. Giles's Church, and stools were flung at the clergyman, a certain woman, *Jenny Geddes*, being, it is said, the first to throw. In order the better to resist attempts against the religion of Scotland, a body known as *The Tables* was elected by those opposed to the innovations. The body consisted of sixteen men, elected four each by the greater nobles, the lesser nobles, the burgesses, and the clergy. Under its leadership the Scotch banded themselves together, and the document known as the *National Covenant* was drawn up and signed by all ranks. By this document persons bound themselves to resist all changes in religion, and to join together for mutual defence. A great assembly of the Church met in Glasgow and abolished the office of Bishop. In 1639 Charles proceeded against Scotland with an army. The Covenanters, as they came to be called, under General Leslie, marched to meet him, but when the two armies came in sight of each other a temporary peace was concluded, without any fighting.

3. Narrate the military operations in the Crimean War, with dates.

In 1854, an army of 51,000 men, under Marshal St. Arnaud and Lord Raglan, landed at Eupatoria in September. As they marched along the shore of the Crimea they discovered 50,000 Russians lining the slopes on the banks of the Alma. In three hours the passage of the river was forced, and the enemy fell back on Sebastopol. The French and English took up a position to the south of the town. In October the bombardment of Sebastopol began; but the fortifications were found to be almost impregnable. A Russian attack on the British base at *Balaklava* was repulsed, and here occurred the brilliant, though useless, *charge of the Light Brigade*. Near *Inkerman*, in the same year, November 5, the Russians attacked the British position in the grey morning, and though surprised and outnumbered, the British soldiers and officers, fighting side by side, held their own till, aided by the French, they forced the enemy to retreat, leaving an immense number of dead. During the winter the troops suffered severely, but under Lord Palmerston's Government a better management took place. In the beginning of 1855 the Czar Nicholas died, and Sardinia having joined the Anglo-French alliance, her troops, along with the French, gained a brilliant victory on the banks of the *Tchernaya*. In September the French took the *Malakoff Tower*, and a British forlorn-hope managed to seize the *Redan*, but the enemy's guns forced them to retire with heavy loss. During the next night the Russian leader led off the garrison to the northern part of the town, which they ultimately left, after sinking their ships. The bombardment of *Sveaborg* and the defence of *Kars* are the only other important events outside of the Crimea.

Composition.

Write a letter on 'A Railway Station' *or* 'Winter Amusements.'

Glasgow, 30th April, 1888.

My dear nephew,

It may afford you some amusement, if not information, to read a description of a railway station, and that one the famed St. Enoch's belonging to our own city.

As we approach the entrance up the slope in front of the hotel we have no idea of the great business going on inside. Entering one of the doorways we find a crowd round the little pigeon holes waiting for their tickets, and when got, each traveller is seen rushing off to take his seat. The arrangements for ticket-selling are all for ease to the clerks, whatever travellers may find. Emerging from the hall we find ourselves on a spacious pavement under a huge over-arching roof of ornamental iron-work. As we stand for a moment we see every facility for supplying human needs—refreshments for the hungry or thirsty, literary food for the student, or amusing matter for a pastime; telegraph office for a message to warn our friends; a hotel door open for the reception of wearied travellers; offices to guard luggage that may for the present be only an encumbrance, and, I declare, a barber's shop where, on stepping from the train, your beard may be shaved, your hair cut, and your face washed if you can't get a bath to destroy all traces of travel. Then at night how strange and grand it is to watch the mixed multitude running here and there, followed by an immense shadow—almost a second self—cast by the weird light of the electric lamps! The student of human nature cannot find a much finer place for indulging his fancies than St. Enoch's Station, Glasgow.

I am,
Your loving uncle,
JOHN SMITH.

Latin.

1. Translate:—

(*a*) Gallis magno ad pugnam erat impedimento, quod pluribus eorum scutis uno ictu pilorum *transfixis* et colligatis, cum ferrum se inflexisset, neque evelere neque sinistra impedita satis commode pugnare poterant, multi ut diu iactato brachio præoptarent scutum manu emittere et nudo corpore pugnare.

(*b*) Et quod omnibus fructibus amissis *domi* nihil erat quo famem tolerarent Allobrogibus imperavit ut *iis* frumenti copiam *facerent*; ipsos oppida vicosque, quos incenderant restituere iussit. Id ea maxime ratione fecit, quod noluit eum locum, unde Helvitii discesserant, vacare, ne propter bonitatem agrorum Germani, qui trans Rhenum incolunt, e suis finibus in Helvitiorum fines transirent et finitimi Galliae provinciae Allobrogibusque essent.

2. Parse and explain the construction of the words in italics.

Translation.

(*a*) It proved a great impediment to the Gauls as regards the fight for several of their shields being transfixed and bound together by a single blow of the javelins, they could not, when the iron had bent itself, either pull them out nor with their left hand embarrassed, could they fight conveniently enough; so that many, their arms being tossed to and fro for a long time preferred to cast their shields from their hands and with the body unprotected.

(*b*) And because all the fruits of the ground being lost there was nothing at home by which they could avert starvation, he ordered the Allobroges to procure a supply of corn for them, and ordered themselves to rebuild the towns and villages which they had burned. He did that principally for this reason, because he was unwilling that the place from which the Allobroges had departed should be unoccupied, lest the Germans who dwell beyond the Rhine, should in consequence of the fertility of the lands, cross over from their own territories into the territories of the Helvitti, and should be neighbours to the province of Gaul and the Allobroges.

PARSING.

Transfixis—abl., pl., neut., complete part, trans. verb, 3rd, conj., *transfigo, fixi, fixum, figere*, forming with 'scutis' abl. absolute.

domi—sometimes considered a gen. of 'domus' but more properly a locative meaning 'at home,' and equivalent to an 'adverb of place.'

iis—dat., pl., indirect object, demons. pron., *is, ea, id.*

facerent—trans. verb, 3rd conj. *facio, feci, factum, facere*, subj., impef., 3rd pers., pl., agr. with (allobroges).

3. What are the rules of *oratio obliqua*?

In *oblique narration* the principal verb must be in the *infinitive* mood, and the subordinate clauses that express the *original speaker's words* or *opinions* will have their verbs in the *subjunctive* mood.

4. Translate into Latin:—

(*a*) Cæsar feared lest the Germans should occupy the territories of the Helvitii.

(*b*) If I find your son in the city, will you not rejoice greatly?

(*c*) The General married the daughter of the King.

Translation.

(*a*) Cæsar timebit ut Germani fines Helvitiorum occuparent.

(*b*) Si filium tuum in urbe inveniam, nonne multum gaudebis?

(*c*) Dux filiam regis in matrimonium duxit.

Teaching.

1. How would you begin to teach Grammar to a Second or Third Standard? Give a short outline of a first lesson.

FIRST LESSON IN GRAMMAR TO STANDARD II.

Having written a few very simple sentences on the blackboard such as 'birds sing,' 'boys talk,' 'ducks swim,' the pupils will be brought to see that there are two essential parts (1) a naming part, and (2) an acting or affirming part. From these the two fundamental parts of speech, the noun and the verb, may be illustrated; the naming part being the *noun* and the affirming part the *verb*. For a first lesson names of persons, as boy, girl, man, woman; names of trades, as farmer, sailor, baker, &c., can easily be got, and the pupils will see that though these words agree in being names of persons, yet they differ in not being *the same* person. Thus, the word *baker* is a noun because it denotes a person who bakes; the word *sailor* is a noun because it denotes a person that sails, and so on; further examples being got from the class, with reasons for the words being nouns.

2. Write notes of a Lesson for an Infant Class on 'Money.'

NOTES OF A LESSON ON 'MONEY.'

I. THINGS TO BE SEEN AND INSPECTED.—*Real coins: farthing, halfpenny, penny; threepenny piece; sixpence, shilling, florin, half-crown, and the others, if thought necessary.*

II. INTRODUCTION.—Question as to who have gone to shop; what was bought? what some would like to buy; what is buying? what was paid? and name of what is given for goods bought; thus eliciting the term 'Money.'

III. WHAT IS MONEY?—Coins of metal (let the metallic ring of a coin be heard), as gold, silver, bronze; different names given to distinguish the coins—which is the most valuable?—children to examine the coins, and tell what they see on them, their shape, colour, comparative weight, hardness.

IV. USES OF MONEY.—Paying for work done; goods bought; railway fares; question as to saving money as provision for old age; helping parents; children can save money by being careful of their clothing, books, &c.

END OF FOURTH YEAR.

FIRST PAPER.

(*Two hours and a half allowed for this paper.*)

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write in large hand, as a specimen of copy-setting, the word 'Acknowledgement.'

Write in small hand, as a specimen of copy-setting, the sentence 'Kind hearts are more than coronets.'

Arithmetic.

MALES.

(*Solve any* TWO *of the following questions.*)

1. At what rate of interest will the present worth of £99 8s. 9d., payable two years hence, be £92 10s.?

£99 8s. 9d. − £92 10s. = £6 18s. 9d. interest for 2 yrs.

Pres. worth : Pres. worth :: Interest : rate for 2 yrs.

£92 10s. : £100 :: £6 18s. 9d. : rate for 2 yrs.

or 1665d.

$$\frac{1665\text{d.} \times 100}{92 \cdot 5} = 1800\text{d.} = £7\tfrac{1}{2}.$$

$\therefore$ £7½ for 2 yrs. = $3\frac{3}{4}$ p.c. per annum.

2. Two men run a race, the one at the rate of 350 yards a minute, the other 325; express in miles the distance by which the former will beat the latter in a distance of 3½ miles.

(*a*) Yds. in 3½ mls. = 1760 × 3½ = 6160 yds.

(*b*) No. of min. run by 1st = $\frac{6160}{350} = 17\frac{3}{5}$ min.

(*c*) The 1st gains 25 yds. every min. and $\therefore$ he gains 25 yds. × 17⅗ or 440 yds. in 3½ mls. and 440 yds. = ¼ ml. Ans.

3. The surface of a rectangle 8 inches wide is the fifth part of a square yard; find its length.

$$\text{Length of rectangle} = \frac{\frac{1}{5} \text{ of } 9 \text{ sq. ft.}}{8 \text{ in.}}$$

$$= \frac{9 \times 144}{5 \times 8} \text{ in.}$$

$$= \frac{162}{5} = 32\tfrac{2}{5} \text{ in.} = \underline{2 \text{ ft. } 8\tfrac{2}{5} \text{ in.}}$$

FEMALES.

1. For what time was £156 5s. invested at 2¾ per cent. when it amounted to £175 3s. 1½d.?

£2 15s. : £18 18s. 1½d.
or or
1320 halfd. : 9075 halfd.
£156¼ : £100
:: 1 yr. : time

$$\frac{1 \text{ yr.} \times 9{,}075 \times 100 \times 4}{1320 \times 625} = \underline{4\tfrac{3}{4} \text{ yrs.}} \quad \text{Ans.}$$

2. *See 3rd yr. Arithmetic. Males. No. 2.*

3. If 30 men can reap 60 acres of wheat in 15 days of 14 hours each, how many days should 20 men and 35 women take to cut 86⅔ acres, if three women do as much as two men?

35 women = 35 × ⅔ = 23⅓ men.

43⅓ men : 30 men
60 ac : 86⅔ ac
:: 15 days : time

$$\frac{15 \text{ days} \times 30 \times 86\frac{2}{3}}{43\frac{1}{3} \times 60} = \frac{45 \text{ days} \times 90 \times 260}{130 \times 180} = \underline{15 \text{ days.}}$$

4. *See 3rd yr. Arith. Males. No. 1.*

Euclid.

(*Bookwork, well done, will get "G"*)

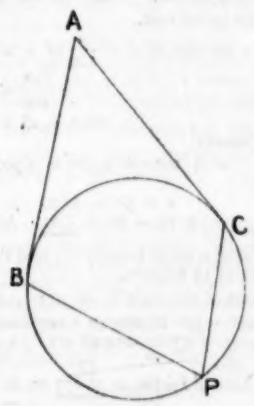
1. If a side of any triangle be produced, the exterior angle is equal to the two interior and opposite angles, and the three interior angles of every triangle are equal to two right angles.

Bk. I., Prop. 32.

2. The opposite angles of any quadrilateral inscribed in a circle are equal to two right angles.

Bk. III., Prop. 22.

3. Two tangents are drawn to a circle from a point A, meeting it in B and C. P is any point on the circumference outside of A B C. Show that the sum of the angles A B P, A C P is constant.



Since the figure A B C P is a rectilineal quadrilateral figure, its four interior angles are equal to four right angles. Now since the angle at A is constant, and the value of the angle B P C is the same wherever P may fall on the circumference, being always in the same segment, therefore the sum of A B P, A C P will always equal the difference between four right angles and the sum of the two constant angles B A C, B P C. Wherefore the sum of A B P and A C P is constant.

Q.E.D.

Algebra.

(Solve any *three* of the following questions.)

1. Simplify—

$$\frac{x(x+y)}{x^2-y^2(x-z)} + \frac{y(y+z)}{(y^2-z^2)(y-x)} + \frac{z(z+x)}{(z^2-x^2)(z-y)}$$

After cancelling, the above expressions become :

$$\frac{x}{(x-y)(x-z)} + \frac{y}{(y-z)(y-x)} + \frac{z}{(z-x)(z-y)}$$

since $\frac{y}{(y-z)(y-x)} = \frac{y}{(y-z)\times-(x-y)} =$

$$-\frac{y}{(y-z)(x-y)}.$$

$$\frac{z}{(z-x)(z-y)} = \frac{z}{-(x-z)\times-(y-z)} = \frac{z}{(x-z)(y-z)};$$

Therefore the expression

$$= \frac{x}{(x-y)(x-z)} - \frac{y}{(y-z)(x-y)} + \frac{z}{(x-z)(y-z)}$$

L.C. Denominators $= (x-y)(x-z)(y-z)$

Therefore the expression becomes

$$\frac{x(y-z)}{(x-y)(x-z)(y-z)} - \frac{y(x-z)}{(x-y)(x-z)(y-z)} + \frac{z(x-y)}{(x-z)(y-z)(x-y)}$$

$$= \frac{xy-xz-xy+yz+xz-yz}{(x-y)(x-z)(y-z)}$$

$$= 0.$$

2. Solve the following equation—

$$\frac{(x+1)(x+2)}{x^2-1} = \frac{7}{3} + \frac{16-x^2}{2x(4+x)}$$

After cancelling, the equation becomes

$$\frac{x+2}{x-1} = \frac{7}{3} + \frac{4-x}{2x}$$

Clearing of fractions

$$6x^2 + 12x = 14x^2 - 14x + 12x - 12 - 3x^2 + 3x$$

Transposing and collecting

$$5x^2 - 11x = 12$$
$$x^2 - 2\tfrac{1}{5}x = 2\tfrac{2}{5}$$

Completing square

$$x^2 - 2\tfrac{1}{5}x + 1\tfrac{21}{100} = 2\tfrac{2}{5} + 1\tfrac{21}{100} = \tfrac{261}{100}$$

Taking the root

$$x - 1\tfrac{1}{10} = \pm 1\tfrac{8}{10}$$
$$x = 1\tfrac{1}{10} \pm 1\tfrac{8}{10} = \underline{3} \text{ (or } -\tfrac{7}{10}\text{)}. \quad \text{Ans.}$$

3. An ox is sold for £24. The gain per cent. is equal to the original cost of the animal. What was the cost.

Let £x = the prime cost,

$$x \text{ per cent of } x = \frac{x}{100} \text{ of } x = \frac{x^2}{100}$$

$$\therefore x + \frac{x^2}{100} = 24$$

$$100x + x^2 = 2{,}400$$

Completing square

$$x^2 + 100x + 2{,}500 = 4{,}900$$

Taking root

$$x + 50 = \pm 70$$
$$x + 70 - 50 = \underline{£20}. \quad \text{Ans.}$$

4. The radius of a circle being 9 ft., find the area of a sector having an angle of 55 degrees.

(*a*) The area of the circle $= 9^2 \times 3{\cdot}1416 = 254{\cdot}47$

(*b*) $360^\circ : 55^\circ :: 254{\cdot}47$: required area.

$$\frac{254{\cdot}47 \times 55}{360} = \frac{254{\cdot}47 \times 11}{72} = 38{\cdot}877$$

∴ Area of Sector = $\underline{38{\cdot}877}$ sq. ft. Ans.

Grammar.

'The king I fear is poisoned by a monk :
I left him *almost speechless*, and broke *out*
To acquaint you with this evil, that you might
The better arm you to the sudden time,
Than if you had at leisure *known* of this.

1. Give a general analysis of the above passage.
2. Parse the words in *italics*.

GENERAL ANALYSIS.

A. 'I fear.'—*Principal sent.*
  a. '(that) the king is poisoned by a monk.'—*Subord. noun sent. object of A.*

B. I left him almost speechless.—*Principal sent.*

C. I broke out to acquaint you with this evil.—*Principal sentence. Co-ord. with B.*
  c^1. 'that you might the better arm you to the sudden time.'—*Subord. adv. sent. of purpose to C.*
  c^2. 'than (you would have done).'—*Subord. adv. sent. of comparison to C.*
  c^3. 'if you had at leisure known of this.'—*Subord. adv. sent. of condition to* c^2.

PARSING.

almost—adv. of degree mod. 'speechless.'
speechless—predicating adj., qual. 'him.'
out—adv. place mod. 'broke.'
The—adv. mod. 'better.'
better—adv. of manner, com. deg., mod. 'arm.'
arm—reg. trans. verb, act., infin., pres., gov. by aux. verb 'might.'
Than—subord. conj., introd. elliptical sent. of comparison.
known—complete part. of irreg. verb ; *know, knew, known*, forming, with 'had,' past perf., indic.

3. Tell the derivation of :—*March, Circumference, Catastrophe, Finger, Grandfather, Marigold, Calico, Centigrade.*

WORD.	DERIVATION.
March	(Latin) *Mars*, the god of war.
Circumference	(Latin) *circum*, round about, and *ferre*, to carry.
Catastrophe	(Greek) *cata*, down, *strophe*, a turning.
Finger	(English) probably from the same root as 'fang' (*fangen*, to seize).
Grandfather	(Latin through French) *grand*, great ; (Saxon) *fader*, or *fæder*, a father.
Marigold	(Hebrew) Mary (French, Marie), and (English) *gold* or *gould*, gold.
Calico	(Indian) *Calicut*, the town whence it was imported.
Centigrade	(Latin) *Centum*, a hundred ; and *gradus*, a step, a degree.

4. Correct any errors in the following sentences :—
(*a*) The room was full from one end to another.
(*b*) Neither James nor his brother knew their lessons to-day.
(*c*) He went out to get change of a sovereign.
(*d*) Are either of these boys your friend?

CORRECTIONS.

(*a*) The room was filled from one end to the other.
(*b*) Neither James nor his brother knew his lessons to-day.
(*c*) He went out to get change for a sovereign.
(*d*) Is either of these boys your friend?

SECOND PAPER.

Geography.

(*Three hours allowed for this Paper.*)

1. Draw a map of the Mediterranean.

2. Give some account of the Gulf-stream.

THE GULF STREAM.

The main stream of the great Atlantic current sweeps past the coast of S. America, and, passing through the Windward Islands and across the Caribbean Sea, enters the Gulf of Mexico, where it gets the name of the 'Gulf Stream.' As the current sweeps round the Gulf it becomes very warm, and is swollen by the waters of the Mississippi till at length it forces its way out into the Atlantic between Florida and Cuba, in a stream of from

30 to 40 miles wide, and 600 or 700 feet deep, and at a speed of about 80 miles a day. At first it keeps pretty close to the coast of America, but by degrees widens out, and bears away to the east, running between Newfoundland and the Azores. There it parts. The main body turns round the Azores, and goes off southwards between those islands and Spain down to the African coast. The other portion runs on northward between Britain and Iceland, giving warmth and moisture to Cornwall, Ireland, the Hebrides, and the Shetland Islands. The northward motion of the Gulf Stream necessitates a southward motion from the Polar Seas, and so a current of cold water runs immediately beneath it past Labrador to replace the warm water brought from the tropics.

3. Describe the physical features and productions of British Columbia. What advantages does it offer to emigrants?

The eastern boundary of British Columbia is formed by the Rocky Mountains, and in this part of the immense range is Mount Hooker. Most of British Columbia is high table-land, propped up by the Rockies on the one side and the Cascade Range on the other. Through this table-land the rivers Skeena and Frazer have gnawed out deep ravines, just as the Pacific has fretted the shores into creeks and inlets. The mountain sides are covered with magnificent forests, haunted by the grizzly bear, and the plateau between the ridges is covered with grassy prairies.

The climate is not very pleasant and the settlers who resort thither are attracted by the gold along the River Frazer.

Vancouver Island, about the size of Scotland, though mountainous and barren abounds in coal, the export of which to places on the seaboard affords the chief source of wealth to the capital, Victoria. Other sources of wealth are gold and salmon fisheries. So plentiful are salmon on the Columbian rivers that in some places during the spawning season the fish have been known to push each other ashore. Land is obtained on easy and liberal terms, and there is a great demand for female servants as the males largely outnumber the females.

History.

(Answer *any two* of the following questions.)

1. Give some account of the Scottish Parliament and Privy Council in the period 1603-1707.

2. State, with dates, the terms of the Secret Treaty of Dover, the Habeas Corpus Act, and the Riot Act.

3. What do you know of Robert Walpole and the elder Pitt?

4. State generally the causes that led to the Crimean War, the terms of the treaty that closed it, and any terms of the treaty that have since been allowed to fall into desuetude.

(2) In 1670 Charles II. concluded with Louis XIV. a Secret Treaty at Dover in which Charles agreed—(*a*) to declare himself a Roman Catholic; (*b*) to aid Louis in his designs on Holland and Spain; Louis agreed to pay Charles a pension of £120,000 a year, and to send 6,000 men in case of opposition in England.

Habeas Corpus Act passed 1679 declares that:—(*a*) All persons, except those charged with treason or felony, can demand a writ directing the jailer to bring them before him so that the legality of their imprisonment may be tested.

(*b*) All persons charged with treason or felony must be tried at the next sessions after commitment or else admitted to bail.

(*c*) No person can be recommitted for the same offence.

The Riot Act was passed in the reign of George I. (1715) and provides that if any persons to the number of twelve or more meet for the purpose of disturbing the peace, and a magistrate or other officer reads an order commanding them to disperse, all who remain after that order are guilty of felony.

(3) Sir Robert Walpole Earl of Orford was the greatest statesman of the first half of the eighteenth century. He studied at Cambridge and entered parliament where he soon gained such a reputation as to be made secretary of war and to have other appointments, but a change of parties deprived him of his offices and sent him to the Tower. On the accession of the House of Hanover he again came to the front, and from 1714 to 1742, with the exception of three years when the South Sea scheme was in full operation, he guided the affairs of England. His personal history is lost in that of England; and few, except his own partisans, can look on that long period as one in which this country was even maintaining its reputation for honesty. He ruled the Commons by bribery and the king by the grossest flattery. He was made a peer for his services and died in 1745.

William Pitt, Earl of Chatham, was a great parliamentary orator and political leader of the last century. After studying at Oxford he entered the army, but being elected a member of parliament he set out on a career which led him more rapidly and surely to fame. From his great abilities he rose to be Secretary of State which he held almost continuously till the end of the reign of George II. His administration was marked by great vigour and enterprise, and it was so successful that the people dazzled by the great victories forgot the heavy taxes imposed to maintain the armies. On the accession of George III. he resigned his post, but when American affairs became critical he was made head of the government. However the ministers he had collected were of too miscellaneous and inconsistent a kind and he soon laid down office again. He appeared in his place as usual and spoke in favour of Wilkes and the Dissenters against the American war till he closed his career by falling in a fit on the floor of the House of Lords. Carried to his house he never rallied but died in 1778.

Composition.

Write an essay on the utility of History as a school subject.

HISTORY.

History and especially the history of one's own country is very properly made a subject of study in schools. It is a study which tends very materially not only to bring out the critical powers but also to strengthen the moral sense of the student. There is but little doubt that the reading of a trustworthy record of the deeds done by British heroes and statesmen must have a beneficial effect upon the minds of British boys and girls, as our history is full of the very best lessons for them. History must not be considered a mere catalogue of kings and queens with the events of each reign to be committed to memory; but the pupils must be trained to follow out the gradual development of the nation by observing the steady process of its growth under certain never changing laws. A more important function of the study of history is to prepare the young for taking their places and performing their parts as good citizens of the greatest nation on the face of the globe. Great care must be taken in studying history not to take a one-sided view of the national character, but to see that the triumphs of peace have been as glorious as the victories of our warriors, and also not to form an over estimate of our nation, but to learn that other nations have their history and must feel like ourselves that they also are countrymen of no mean country.

Latin.

1. Translate:—

Æolus hæc contra: 'Tuus o regina, quid optes,
Explorare labor; mihi jussa capessere fas est.
Tu mihi, quodcunque hoc regni, tu sceptra Jovemque,
Concilias; tu das *epulis* accumbere divum,
Nimborumque facis tempestatumque potentem.'
Hæc ubi dicta, cavum conversa *cuspide* montem
Impulit in latus; ac venti velut agmine facto,
Qua data porta, ruunt, et terras turbine perflant.
Incubuere mari, totumque a sedibus imis
Una Eurusque Notusque ruunt creberque procellis
Africus, et vastos *volvunt* ad litora fluctus:
Insequitur clamorque virum stridorque rudentum.

2. Parse and explain the construction of the words in italics.

3. Express in Latin in as many ways as you can—'Ambassadors came to Rome to sue for peace.'

4. Translate into Latin:—

Orgetorix persuaded the Helvetii to quit their territories and seek a new settlement (sedes). They were easily persuaded, because they were prevented by their narrow confines from making war on their neighbours. They established peace and friendship with the states through whose territories they intended to pass, and at the same time asked the Raurici and others to burn their towns and go with them.

OPTIONAL.

5. Translate:—

Interea, dum haec geruntur, hostium copiae ex Arvernis equitesque, qui toti Galliae erant imperati, conveniunt. Magno horum coacto numero cum Caesar in Sequanos per extremos Lingonum fines iter faceret, quo facilius subsidium provinciae ferri posset, circiter millia passuum x ab Romanis trinis castris Vercingetorix consedit convocatisque ad concilium praefectis equitum venisse tempus victoriae demonstrat.

(1) Æolus says thus in reply:—'Thy work, O queen, is to discover what thou wishest; it is my duty to perform with zeal what thou dost command. Thy gift to me is all this kingdom which I have, and this my sceptre, thou makest Jove my friend, thou grantest me a seat at the banquets of the gods, and causest me to be lord of storms and tempests.'

When these words were said he turned the point of his spear and pushed on its side the hollow mountain; and the winds as in a formed line rush forth where a passage is given them and blow with a blast across the world. They swoop down upon the sea and Eurus (the east wind), and Notus (the south) and the storm-crowded Africus (the south-west), together lash the whole ocean from its lowest depths, and roll huge billows to the shore. Then follow the shouts of the men and the creaking of the cordage.

PARSING.

(2) *Epulis*—locative abl. pl. noun, 1st decl., *epulae, epularum.*

cuspide—abl. absol. with *conversâ*, noun, 3rd decl., *cuspis, cuspidis.*

Incubuere—trans. verb, 3rd conj., *incumbo -cubui -cubitum -cumbere*, pret., indic., 3rd pers., pl., subj. (venti).

volvunt—trans. verb, 3rd conj., *volvo, volvi, volutum, volvere*, pres., indic., 3rd, pl., subj., Eurus, &c.

(3) Ambassadors came to Rome to sue for peace: Legati Romam venerunt (*a*) *pacem petitum*; (*b*) *pacem petendi causâ*, or *pacis petendæ causâ*; (*c*) *ad pacem petendum*, or *ad pacem petendam*; (*d*) *pacem petituri*; (*e*) *qui* or *ut pacem peterent.*

(4) Translation into Latin:—

Orgetorix Helvitiis persuasit ut de finibus suis exirent et novas sedes peterent. Id facile iis persuasum est, quod angustis finibus prohibiti sunt quominus finitimis bellum inferre possent. Pacem et amicitiam cum civitatibus, quarum per fines iter facere iis erat in animo, confirmârunt, et eodem tempore ab Rauricis et aliis petiérunt ut oppidis suis exustis una cum iis proficiscerentur.

OPTIONAL.

(5) In the meantime while these things are being done, the forces of the enemy and the horsemen of the Arverni, who had been demanded from all Gaul, assemble. A great number of these being collected, when Cæsar was passing through the frontiers of the Lingones against the Sequani, a reserve force was the more easily obtained; about ten miles from the three camps Vercingetorix encamps, and having called a council of the prefects of cavalry, he shows that the time for victory had come.

Teaching.

What points would you most insist on in the reading of Sixth Standard scholars? What common faults are to be guarded against in the reading of poetry? or,

Write an outline of a lesson on—

(*a*) The Revolution of 1688; or,

(*b*) The Indian Mutiny.

In the reading of Sixth Standard scholars I should endeavour to make them as far as possible read so intelligently and expressively as to enable me to follow the meaning easily and rapidly when listening without a book. To attain this excellence attention must be paid to the utterance of vowel and consonant sounds, so that the full sound of the word may be heard; to correct accent and emphasis; to the pitch and modulation of the voice; and to the giving of such practice that the scholar's reading may become as natural as when he narrates some incident of his daily life to his schoolfellow.

In reading poetry the common faults are a sing-song style, pausing at the cæsura, and allowing the voice to fall at the end of the lines, regardless of the meaning—the last fault being most usual when the poetry is rhymed.

Oral Teaching: The Preparation of Lessons and of Notes of Lessons.

BY JOSEPH H. COWHAM, F.G.S.,

Master of Method: Westminster Training College.

How to Give a Lesson.

A. The Introduction.—If the lesson be one of a well-arranged series, as we strongly advise it should be, it will suffice to revise briefly the chief points taught in the previous lesson; in this way a connection is easily and naturally established between that already acquired and the new matter to be taught. A few questions will be sufficient to recall the most important facts and truths of the past lesson, and serve to arouse the mental activity of the class, and also to awaken their sympathy and enlist their co-operation. If no previous teaching is available upon which to base an introduction, announce the subject and at once begin to teach it.

The young teacher is strongly cautioned against attempting to lead the children to the subject of his lesson by a process of training. Such introductions are often attempted, and are very rarely successful. A teacher recently gave a lesson on 'Chalk.' As the children were in a London school he thought they might know Brighton. By questioning them, he found that many of his scholars had been there. 'Well, what did you notice?' said the teacher. 'Boats, the steamer, the pier.' These and other objects of interest were given in answer by different children; some boys were anxious to cause a diversion by suggesting donkeys, niggers, &c., but one boy fortunately thought of the '*cliff*.' 'Yes,' said the teacher, delighted to be getting near, as he thought, to the subject of his lesson. 'What was the cliff composed of?' 'Stone,' 'concrete,' 'cement,' said the children in succession. 'No, I don't want those,' said the teacher, almost in despair. 'What are the cliffs composed of when you get away from the town?' After wasting five minutes' time, and still worse, after diverting the thought of the class from the subject to a host of particulars of no value for the purposes of his lesson, he proceeded to examine specimens of chalk with which he had provided himself. This was where he might well have begun his lesson, but having taken the children in thought to Brighton, it was with difficulty that he brought them back to observe the specimens of chalk he held before them.

As soon as possible, therefore, pass over a carefully thought out introduction, and proceed to make the class understand that you have something new to impart. Children soon weary of revising past work; the introduction should quickly place the scholars in the attitude of those who are anxious to learn, and the best way to ensure this is to show them that the teacher is prepared with a lesson he is able to teach.

A **Grammar** Lesson is easily introduced by placing sentences on the board for inspection by the class.

An **Object** Lesson by the exhibition of an object, or a picture, or by the performance of an experiment.

A **Geography** Lesson by showing a model of the district selected for teaching.

A **Reading** Lesson by a very brief account of the subject of the lesson, of its author, or of the conditions surrounding the events of which the lesson is an account.

A **Writing** Lesson by the exhibition of a few very common faults in the writing of the class, followed by a specimen of excellent writing in the teacher's best style.

The **Arithmetic** Lesson is best prefaced by a few simple examples, to be worked by the class mentally and embodying as far as possible the rule to be taught or applied.

B. The Lesson proper and how its matter may be communicated.—Every lesson should aim at carrying further the knowledge already in the possession of the class, and whilst the children may be led to secure some of the new knowledge for themselves there will necessarily be other matter which must be communicated by the teacher. He must, however, be always on his guard against continuously talking to his class for more than a few seconds at a time. There is danger, unless this caution be observed, that too much matter will be supplied for complete reception by the class; when this fault occurs it will be evident in the indifference which the children soon begin to manifest; the method of teaching must be immediately changed; the children must be encouraged to take a more active part in the lesson; questions must be asked upon what has been told, and attempts must be made by the children to connect what has been taught with anything they previously knew. In this way the teacher will be able to impart new matter suited to the capacity of the children; he will secure the advantages of a thorough review of what has been already learned without the irksomeness of a formal revision; new matter will also be associated, and thus the laws of memory will be observed; erroneous notions will be discovered as soon as formed and before they have become established, and through all the lesson the teacher will carry with him that thought and effort on the part of his scholars which no amount of lecturing alone is able either to arouse or to maintain.

(a) Matter taught by a judicious admixture of Statement, Illustration, and Questioning.—Much of what is called 'tact' in teaching is the power a teacher manifests during the development of his lesson to determine which mode he shall adopt in communicating his information. It is obvious that when an object or an experiment is under observation there is very much that the children themselves should state, and the more they can be encouraged to tell the better; at the same time there are less obvious qualities in an object, and there are subtle processes in an experiment to which the attention of his class must be directed by the teacher.

Examples of Teaching:—

1. Suppose the teacher wishes to show his class the effect of heat upon solids and liquids, he may perform the experiment illustrated by Fig. 1.

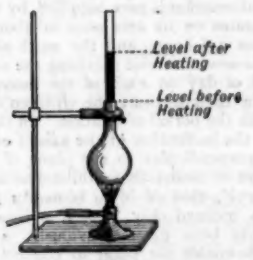


Fig. 1.

At first, after applying heat, the water is noticed to fall slightly in the tube; after a few seconds and after further application of heat the water will begin to rise, and will continue to do this with the continued heightening of the temperature of the water in the vessel. In this experiment the immediate effects are apparently contradictory. Something has escaped the notice of the class; the rising of the water in the tube is clearly due to the expansion of the liquid under the influence of heating. This effect is noticed and will be at once stated by the class in answer to the question, 'What do you observe?' The cause also of what they observe may be obtained from the class, for the only change of condition has been the application of heat. It will be necessary for the teacher now to call the attention of his pupils to the fact that the glass vessel would first feel the effects of heating; if it expand then the vessel will hold more water than at first, and this expansion of the glass will manifest itself in the slight lowering of the water in the tube. In this way our experiment has taught two truths. (1) That heat causes water to expand. (2) That heat also causes the glass vessel containing the water to expand. The first truth, both as to effect and cause, follows directly from the experiment, and is entirely worked out by the class by means of observation, reasoning, and of statement, stimulated and guided by the questioning of the teacher. The second truth, so far as effect alone is concerned, is observed and stated by the class; but further direction and statement on the part of the teacher are required before the cause of what they observe is made clear to the minds of his pupils. Suppose, further, that a number of experiments show that whenever heat is applied to solids and liquids the class may observe the same result. The general truth '*that heat causes solids and liquids to expand*' will soon be established in the minds of the pupils, and should find expression from them in the truth or law just enunciated.

2. In order further to assist in distinguishing what must be told by the teacher from what may be found out and stated by the class, the example of teaching followed on page 304 in the *Practical Teacher* of last month may be quoted. When the functions of the Pronoun had been taught through the examination on the part of the pupils of many examples selected by the teacher, and when these functions had been stated by the class, then the new term 'Pronoun' was immediately supplied by the teacher, whilst its definition was made by the class.

(3) An instance of the attempt frequently made to lead children to state what the teacher should tell will complete our examples. By a careful examination of numerous sentences, under the direction of the teacher, the distinction between the word or group of words which indicate the doer of an action, and the word or group of words which denote the action, has been established in the minds of the children; instead, however, of immediately associating the terms *subject* and *predicate* with each group of words respectively, there is interposed an attempt to train out these words; the children are asked to state the name we use of a book to signify 'the person, or place, or thing which it is all about;' or they are told to think of hearing a sermon, and to name the topic about which the preacher discourses; or of a story, the person about whom it is told. In this way the various uses of the term '*subject*' are introduced as though their introduction could in any way be made helpful to the association of the word subject with its technical application in grammar. Instead of assisting the child to the right use of the terms Subject and Predicate, this method confuses the child, and by the time the term is supplied its grammatical value has become much weakened, if not entirely lost. As soon as the children have seized a notion, let the teacher immediately supply the term associated with it.

In these examples the following conditions of teaching the matter of a lesson are enforced:—

1. That children should be encouraged to state fully what they know already, and what they observe during the progress of a lesson.

2. That the teacher must be ready to state those conditions and those facts which may fairly be expected to escape the notice of his pupils, or may be beyond their knowledge.

3. That whilst the teacher collects and arranges his facts and his examples, the children must be led to compare and to classify them, and also to announce the results of their comparisons and reflections.

4. That children should tell the teacher all they observe in an experiment, and, under the guidance of the teacher, be led to state the less obvious effects, and, further, by processes of reasoning, to connect these with their causes.

5. That the operation of teaching exemplified above is an admixture of illustration, questioning, and statement judiciously distributed and arranged by the teacher with the hearty co-operation of his class.

(b) Questions: their place and power.

A question when put by the teacher to a group of children assumes more or less knowledge on the part of the class of the subject with which it deals, and its effect should be to arouse the scholars to use the knowledge they have for the purpose (1) of making it more perfect, (2) of associating with it other and less familiar matter, and (3) of acquiring information that is entirely new. Questions intended to recall matter previously taught are easily formed, and are named, with slight variations of meaning, **Tentative, Revision, Recapitulation,** and **Examination questions** respectively. Questions which serve the purpose of exercising the mind in finding out wherein its knowledge is faulty, in supplementing knowledge that is incomplete, and in accumulating fresh knowledge, may with justice be termed **Educational.**

1. **Tentative questions** are used at the beginning of a lesson, and at every new departure during the progress of the lesson; they are used to discover the amount and character of the knowledge already possessed by the class. As the teacher cannot be sure of any individual scholar being able to answer them, they ought to be put so that any child may show his ability to answer by show of hand. Tentative questions should be few, and be rapidly completed.

2. **Questions of Revision** are asked at the finish of each stage of the lesson, and should be put so as to review the information taught in the order in which it was originally acquired; in this way the associations of matter first formed are still further strengthened, and, as a consequence, the permanent retention of knowledge and its ready recovery are aided. It is further necessary to revise before the amount of matter taught becomes great, for if delayed too long the first impressions become weakened, and may possibly be lost altogether. This is evident when a teacher, during revision, finds it necessary to help his class in their attempts at recovery.

3. **Recapitulation Questions** are of the same nature, and have the same force as 'Questions of Revision.' They come at the end of a lesson, and thus form the final review of the matter taught.

4. **Examination Questions** are set either over a wide range of subjects, or upon a considerable area in any particular subject. They are useful as a stimulus to thorough review on the part of the pupil, especially when the range of matter is not great; and they further serve to bring out the ability of the pupil, particularly if they are framed with the view of requiring an application of knowledge acquired rather than a display of facts which have been committed to memory. When however, the range of topics is very wide, and the questioning is satisfied with an exercise of memory, the examination becomes of doubtful value, and sooner or later cultivates 'cram' of the worst kind.

5. **Educational Questioning.**—This is the form of questioning most important to acquire, and most difficult to describe. It assumes great variety of forms, changing with every lesson and with every teacher. In common with the modes of questioning already described, it rests upon knowledge which the children have previously acquired, but differs in that this is used chiefly to advance to further knowledge, and in order to arouse in the class mental effort of the highest order. The successful answer to such questioning demands, it may be, the new association of notions already familiar in their separate condition. In this case the *imagination* of the pupil is exercised. Frequently it requires the arrangement of like facts and examples so as to arrive at a new, or an extended and generalized truth, thus calling into activity (1) the *judgment* in the arrangement of classes of facts, and (2) the *reasoning power* in arriving at and in formulating the new truth.

Examples of Teaching. (*a*) Exercise of Memory.

If, for example, I ask a class to tell me what they have learned about the earth as to its shape, its size, and its movements, I shall receive in reply a number of facts which have been stored in the mind from previous lessons, and which are now reproduced by an effort of *memory*.

(*b*) Exercise of Observation and of Judgment.

I proceed to make these facts the basis of a lesson on similar bodies in the solar system, selecting Mars because of its many points of similarity with our earth, and Jupiter on account of its points of contrast.

I first direct attention to some simple balls,* constructed so as to illustrate the relative size of these heavenly bodies, and placed so as to show their relative distance from the sun. A few moments are allowed for observation on the part of the class, and then the teacher asks one of its members to state what he notices about the distance of these objects from the sun; another is asked to state what he observes about their sizes. In this way he obtains, in answers from the class, 'that Jupiter is much further from the sun than either the earth or Mars,' and that 'whilst Mars is less than the earth, Jupiter is much larger than either.' The questions in this case have exercised and directed the *observation* of the children, and their answers indicate that they have made successful efforts of comparison, thus calling into action a simple form of *judgment*.

(*c*) Exercise of Memory and of Judgment.

More information is now supplied by the teacher—'that Jupiter rotates on its axis once in about 10 hours, whilst Mars takes 24½ hours, and the earth about 24 hours. A question is now of service requiring the scholars to calculate the length of day on each of the heavenly bodies respectively. In their answers the children *associate* the length of day with the period of rotation. In the same way I may deal with the inclination of the axis of each heavenly body from the perpendicular to the plane of its orbit, and show by diagram or model that, whilst the axis of the earth is inclined 23½°, that of Mars is nearly 29°, whilst that of Jupiter is inclined only 3°. If a lesson on the earth's seasons has been given previously, a question will be sufficient to enable the pupil to connect the inclination of the axis of Mars with a similarity of seasons on both the earth and Mars, and also to contrast the seasons in Jupiter with those of the smaller planets. Groups of facts are in this way being formed, and are so arranged as to be easily *remembered*, whilst in the effort of arrangement there is an exercise and training of the *judgment*.

* See Notes of Lesson in *Practical Teacher* of this month.

(*d*) Exercise of Reasoning.

Sufficient facts are now accumulated for the exercise of higher efforts of intellect, *e.g.*, if the children are led by a series of questions of revision to recall the many points of similarity established between the earth and its neighbour Mars—distance from the sun, period of revolution, length of day, their seasons, and then add that both have a surface covered in part with land and in part with water, and that both have an atmosphere—the class might now be asked to conjecture any other probable similarity. The answer 'life, animal and vegetable,' would manifest the ability on the part of the class to adopt the imperfect form of reason termed *analogy*. If, now, we take the three heavenly bodies under consideration, and require the class, in answer to our questions, to state the points of agreement amongst them all—revolving round the sun, and shining with reflected light—then ask them to distinguish these resemblances from the points in which they disagree, we get an excellent exercise of the judgment; and when we apply the name 'planets' to these heavenly bodies and further ask the class to define the term, then by the successful effort to answer the question we have aroused and exercised one of the highest intellectual powers possessed by our pupils, viz., that of *abstraction* and of *inductive reasoning*.

In the above sketch we have endeavoured to show how the skilful use of questions may awaken the class to the exercise of **memory and imagination**; to the formation of **general notions** and of correct **judgments**; and lastly, to simple exercises of the **reasoning powers**. The object of 'educational questioning' has been admirably summed up in the following remarks by Dr. Fitch. He says:—'Questioning ought to set the learners thinking, to promote activity and energy on their part, to arouse the whole mental faculty into action instead of blindly cultivating the memory at the expense of the higher intellectual powers. That is the best questioning which best stimulates action on the part of the learner, which gives him a habit of thinking and of enquiring for himself, which tends in great measure to render him independent of his teacher. The success of our teaching must be measured by the degree in which we have strengthened the judgment and enlarged the capacity of our pupils, and imparted to them that searching and enquiring spirit which is a far surer basis for all future acquisition than any amount of mere information.'

(To be continued.)

—o—

How a Scotch School was Examined.

Infants.—As this class was not entered specially as an Infant Department no great stress was laid upon their attainments. A short sentence was read by each one from the book professed by each class.

Writing.—One class, the highest, transcribed a line of print, the second wrote a few capital and small letters, and the lowest made some small letters.

Arithmetic.—A good deal of simple mental arithmetic was required in all the combinations, adding, subtracting, multiplying, and dividing. How many articles in a dozen? half-a-dozen? two dozen? How many in a score? half a score? a score and a dozen? &c. How many threepenny books for a sixpence? for a shilling? for ninepence? pay for a sevenpenny book out of a shilling, how much left? Three threes added together? two fours? two sixes?

No singing was taken, though it was enquired into.

The infants were examined in the largest room, while Standards IV., V. and VI. were doing their written work—a most objectionable practice.

STANDARD I.

Reading.—A number of the boys read from Collins's Improved Series, and the same number of girls read from Chambers's Graduated.

Writing and Arithmetic.—While the half of the others who had not read worked the following sums, the other half transcribed a line from one of the reading books.

Arithmetic read in words, and children placed back to back. Those looking in one direction did Set A, while those looking in the other direction did Set B.

A. (1) 305 + 407 + 90 + 600 + 15. 1,417. Ans.

(2) 987 + 789 + 879 + 999 + 887. 4,541. Ans.

(3) 401 − 195. 206. Ans.

B. (1) 503 + 704 + 19 + 6 + 51. 1,283. Ans.

(2) 769 + 976 + 849 + 567 + 786. 3,947. Ans.

(3) 902 − 607. 295. Ans.

STANDARD II.

Reading.—The reading books were of the same series as Standard I. One-fourth read from their own set, Collins's Improved, and one-fourth read from the school set, Chambers's Graduated. These were examined with closed books on the lessons read, and asked for verbs, nouns, and adjectives in a desultory style.

Writing.—While the third and fourth wrote the following lines to dictation, the remainder of the class worked the two sets of sums which were given similarly to Standard I.

Dictation.—'Presently two of the birds tried to lift the lame little fellow by seizing his wings in their bills, but that plan would not work.'

Arithmetic.—A. (1) 3,709 + 4,008 + 7,984 + 9,876 + 5,986 + 7,295 *(words).* 38,858 Ans.

(2) 7,004 − 309 *(words).* 6,695 Ans.

(3) 2,934,675 − 896,786 *(figures).* 2,037,889 Ans.

(4) 2,997,586 × 6 *(figures).* 17,985,516 Ans.

B. (1) 7,093 + 8,976 + 6,739 + 9,998 + 7,987 + 6,988. 47,781 Ans.

(2) 9,010 − 806. 8,234. Ans.

(3) 4,234,900 ÷ 176,491 (*figures*). 958,409. Ans.

(4) 7,532,468 × 4. 30,129,872. Ans.

The music of Standards I. and II. was taken together—one song being asked, and the following modulator exercise given by the Inspector:—

Modulator Exercise:—Key C. d r m s d' l f r t,
r f l s t d' m l m r l m s t d'

STANDARD II.

Copy books were asked for, and a handful being taken at random, six or seven were minutely looked through.

STANDARD III.

Reading.—This was taken from both sets of books. When one form had read from Collins's Improved Reader, the next read from Chambers's Graduated, and so on alternately till every one had read. The books were then closed and the class tested for intelligence.

Repetition and Grammar were taken together. Each one repeated a few lines of 'The Village Blacksmith.' Along with the meanings of words and phrases, every personal pronoun was taken, in order to find if the pupils knew the noun for which it stood. Simple sentences were selected from the lines by the Inspector, and these were analysed by the scholars.

Geography and History.—The standard was examined on the mountains and rivers of Scotland, and a few of the scholars were taken out in order to be tested on their ability to find places on the map.

In history the examiner began with the battle of Bannockburn, and questioned minutely respecting Bruce, his life and reign. Only a few questions were asked on the life of Mary, but as a semi-voluntary exercise he tried the class on the marriage that led to the union of the Crowns in 1603.

Arithmetic.—Specimen cards.

A. (1) Multiply eighty thousand and seventy-nine by nine thousand five hundred and eight.

761,391,132. Ans.

(2) 152,958,059 ÷ 159.

962,000 59/159. Ans.

(3) Divide nine hundred and four thousand four hundred and ten by forty-five (factors).

20,098. Ans.

(4) Add together £37 0s. 4½d.; £2 17s. 6d.; £99 9s. 0¼d.; and £19 12s. 3½d.

£158 19s. 2¼d. Ans.

B. (1) 239,381,818 ÷ 817.

2,930,001 53/817. Ans.

(2) Divide eight hundred and eighty-two thousand four hundred and forty-one by sixty-three.

14,007. Ans.

(3) Multiply 730,049 by 3,960.

2,890,994,040. Ans.

(4) Subtract £990 17s. 1¾d. from £8,075 13s. 4d.

£7,084 16s. 2¼d. Ans.

Music was taken with Standard IV., and the writing copies were looked through.

STANDARD IV.

Reading.—The boys read from Collins's Readers, and the girls from Nelson's Historical and Geographical Reader. (Before this arrangement was arrived at the examiner took a vote of the class as to which book was the favourite, and the majority chose the latter.) The intelligence was tested from Collins's, and a few questions on grammar and analysis were taken from the same book. The following sentences were to be answered on paper. Analyse the following sentences, parsing the words underlined (italics).

A. In the *evening* a breeze *sprang up* from the sea.

B. After his *defeat* Bruce *found refuge* in the Isle of Rathlin.

Repetition.—One here and there throughout the class had to repeat a few lines from 'The Battle of Morgarten,' but everyone had to answer on meanings and allusions. Particular stress was laid on the 'pronouns,' as in III., and questions given on the geography of Switzerland, as to its people, industries, and appearance, with particular reference to avalanches. Story of 'Tell and the Apple' was alluded to.

History.—Commonwealth; character of Cromwell, success as a general and as a ruler; Charles II.; returning to Montrose's campaigns in Scotland, and some questions on Charles I.

Geography.—Mountains and rivers of England; capes and rivers of Ireland.

Writing.—Copies were looked by sample. Curious test of discipline: the class was told to prepare a page of history while the examiner tested the intelligence of Standard III.

Arithmetic.—

A. (1) Reduce 1,516,680 poles to miles.

4,739 miles 5 fur. Ans.

(2) Multiply £97 2s. 11½d. by 5,068.

£492,345 12s. 10d. Ans.

(3) How many half-crowns in seven hundred and thirty thousand and eighty farthings? 6,084. Ans.

4. In 3 qrs. 3 ozs. how many ozs?

1,347 ozs. Ans.

B. (1) Multiply £2 8s. 6½d. by 5, and subtract the result from £204 6s. £192 3s. 3½d. Ans.

(2) Multiply 31 cwts. 1 qr. 3 lbs. by sixty-one.

95 tons 7 cwt. 3 qrs. 15 lbs. Ans.

(3) Divide two hundred and six thousand and fifty pounds eleven shillings and seven pence by three thousand one hundred and twenty-four.

£65 19s. 1¾d. Ans.

(4) Reduce 7,643,219 poles to sq. miles.

74 sq. mls. 410 ac. 19 po. Ans.

STANDARD V.

Reading.—This Standard had two sets of books—Collins's Improved and Nelson's Hist. and Geog. Readers. The reading was taken from the latter.

Writing.—A rather lengthy story about a shipwreck was read twice, and at the same time two sentences were given for analysis, with three or four words to be parsed on paper.

Geography.—Maps of (1) India, (2) Australia, and (3) Spain were given alternately, and when these maps were handed in, with physical features marked, the pupils were asked to indicate the position of three or four important towns.

History.—The cause, incidents, and result of American War of Independence, with special questions on English and American generals and statesmen.

Repetition.—Portion of 'Prisoner of Chillon,' with grammar and syntax of the passage.

Arithmetic.—

A. (1) Multiply the difference of $\frac{1}{15}$ and $\frac{3}{10}$ by $\frac{2}{3}$ of $\frac{3}{7}$. $\frac{1}{15}$. Ans.

(2) Find by Practice the value of 370 articles at £150 18s. 9¾d. each.

£55,848 0s. 7½d. Ans.

(3) Make out and receipt the following bill:—

48 lbs. at 1s. 1½d. per lb.
11½ lbs. at 1s. 4d. per lb.
62 lbs. at 6½d. per lb.
Milk for 14 days at 3½d. per day.

(£2 14s. + 15s. 4d. + £1 13s. 7d. + 4s. 1d.)
Total, £5 7s. Ans.

(4) Income tax being levied at the rate of £1 7s. 1d. for £100, what is a person's income on which £121 17s. 6d. is paid?

£9,000. Ans.

B. (1) Find the worth of 479 articles at £71 6s. 11½d. each.

£34,175 13s. 0½d. Ans.

(2) Make out and receipt the following bill:—

1,300 penholders at 4d. per score.
84 lead pencils at 9d. per dozen.
47 articles at 2¼d. each.
10 boxes at 3d. per box.

(£1 1s. 8d. + 5s. 3d. + 8s. 9¾d. + 2s. 6d.)
Total, £1 17s. 2¾d. Ans.

(3) Find the dividend on a debt of £626 6s. 3d. of a bankrupt who pays 13s. 4d. in the £.

£417 10s. 10d. Ans.

(4) Divide the sum of $\frac{3}{5}$ and $4\frac{1}{2}$ by $\frac{2}{5} \times 5\frac{3}{4}$.

$2\frac{5}{23}$. Ans.

Copy-books of Standard V. were also asked for.

STANDARD VI.

Reading.—This standard read only from Collins's Improved and the examiner was satisfied with one or two sentences from each member of the class.

Grammar and analysis were done on paper, and taken away by the Inspector. The heads of a letter were given, the matter being about a painter who painted from memory the picture of his dead child, and the point of the story was to show that a work done from love was better executed than that which was done for money alone.

Repetition.—This was taken along with Standard V. and examined in exactly the same manner.

Geography.—A list of the Colonies was asked, and a general and then a particular questioning on the Australian Colonies followed. An imaginary voyage round the world from London eastwards and back to London was an interesting feature of this subject.

History.—After a running fire of questions on the whole of their portion from George IV. to the present times, a minute account of the history of the Reform Act of 1832 was asked for.

Arithmetic.—*A.* (1) If the carriage of $3\frac{1}{4}$ cwts. for 25 miles cost 10d., what will it cost to have 21 cwts. 42 lbs. conveyed 63 miles? 8s. 6¾d. Ans.

(2) What is the amount in minutes of $\frac{1}{3}$ of 1 week + $\frac{1}{3}$ of a day + $\frac{1}{8}$ of an hour? 3,655½ min. Ans.

(3) Find the value of $4\frac{1}{4}$ gallons, when the cost of 110·5 gallons is £$3\frac{1}{3}$? 2s. $4\frac{11}{13}$d. Ans.

(4) If the amount of £360 at the end of four years be £540, what is the rate per cent.? 12½. Ans.

B. (1) A can do a piece of work in $3\frac{1}{3}$ days, B in $4\frac{1}{3}$ days, when will they do it working together?

$1\frac{3}{4}\frac{5}{5}\frac{7}{7}$ days. Ans.

(2) Reduce $4\frac{1}{2}$ roods to the decimal of 24 square inches. 294,030. Ans.

(3) In what time will the interest on £250 amount to £15 12s. 6d., at 2½ per cent.?

2½ yrs. Ans.

(4) Simplify $\frac{4\frac{1}{2} - \cdot 05}{\cdot 0125}$ of £175.

£62 6s. Ans.

Music.—The Inspector pointed the following exercise on the modulator: (Key C.)—**d s fe s d' t l d' ta l t d' l se l s se l s fe m fe s l m f r d s d' ta l l ta d**
No ear exercise was given.

Sight-Test.—(Key E.):

m	.f	|s	.s	:s	.s	}			
|s	.,m	:d	.m,d	|s_1	.s_1	:s_1,t_1	.r,t_1	|d	: .m }
|m	.m	:m	.r	|de	.d	:-	.de	|r	.r, .l, .l$_1$s }
|f	:m,f	.m,f	|s	.m	:d				

The teachers of Standards III., IV. and V. were asked to correct the work of their own classes.

The registers were tested by the Inspector's assistant, who took one name from every Standard on the Schedules.

Sewing.—First day of Inspection. Three children from Infant Department, and the same number from Standards I. and II. were selected to do specimens of the work set for them in Schedule 3. At the same time the pupil teachers wrought the work allotted to them, as much or as many specimens as they could do in an hour and a half. On the second day, three girls from each of the upper Standards III., IV., V. and VI., were asked to do different portions from the divisions as per Schedule 3.

These specimens were done not in the presence of the Inspector, but in a room apart from the others. The mistress and pupil teachers were allowed to superintend and supply the girls with needles, thread, &c.

Notes of a Lesson on the Planetary System and its General Arrangement.

BY JOSEPH H. COWHAM, F.G.S.,

Master of Method: Westminster Training College.

INFORMATION TO BE TAUGHT.

A. Revision of Motions of the Earth as a Member of the Solar System.

1. That the earth *revolves* round the sun once in each year.

2. That it *rotates* on its axis once a day, thus causing **Day and Night.**

3. That its axis is not perpendicular to the plane of its orbit, **but is inclined from the perpendicular 23½°.**

4. That in consequence of its motion of revolution, and the constant direction the axis maintains in space, the earth has four seasons **—Spring, Summer, Autumn and Winter.**

B. Points of Comparison between the Earth and some of the other members of the Solar System.

1. Distances from the Sun.

(*a*) The mean distance of the earth from the sun has been carefully calculated, and is estimated to be about **91½ millions of miles.**

(*b*) If now we compare the distance of each of the other bodies under consideration with the earth's distance, we get the following approximate results:—

Mercury	·39	Jupiter	5·3
Venus	·72	Saturn	9·5
Earth	1·	Uranus	19·
Mars	1·5	Neptune	30·

ILLUSTRATIONS AND TEACHING HINTS.

1. The following diagram may be used to represent the earth in two positions with an interval of six months between them.

2. The effect of rotation is best shown by placing a paper cylinder over half the globe, as shown in the diagram, a portion of the earth then rotates in the dark whilst the remaining portion rotates in the light.

3. This inclination is shown in the diagram.

4. The opposite seasons of winter and summer will be readily recalled by reference to the earth at the winter and summer solstices. (For full explanation see Lesson on Climate in *Practical Teacher*, Vol. VII., No. 9.)

(*a*) The distance of the earth from the sun is so great that it is difficult to impart the notion of it to children. The fastest trains are those running between London and Edinburgh and their average speed is about 54 miles per hour. If now we suppose a train able to travel at an average rate of 60 miles per hour—a mile per minute—and this train to leave our earth in the year 1888 it would arrive at the sun in the year 2063, after rushing along night and day during **175 years.**

Fig. 2. Illustration of the relative distances of each body in the Solar System from the Sun and from each other.

The rings round the Earth and some of the other bodies represent the number of moons or satellites. In order to make the relative distances here illustrated more familiar, simple problems like the following should be worked by the class:

> If a train travelling 60 miles an hour reaches the sun in 175 years, how long would it take a train to travel over the distance between (*a*) Jupiter and the Sun (*b*) Jupiter and the Earth.

2. Relative size of each member of the Solar System compared with the Earth.

If we reckon the diameter of the earth 8000 miles, and its circumference 25,000, then the length of diameter of each of the other members of the system will be as follows:—

Mercury	·37	Jupiter	10·5
Venus	·9	Saturn	9·
Earth	1·	Uranus	4·
Mars	·6	Neptune	4·5
Sun	107		

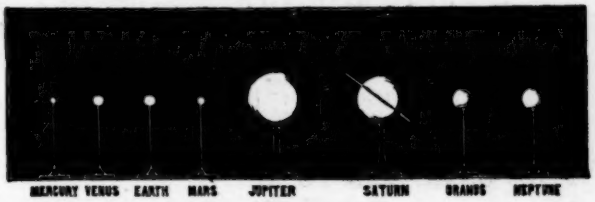


Fig. 3. Diagram of models drawn to scale illustrating the relative sizes of the bodies named.

Firstly, encourage the class to realize the size of the Earth in the same manner as that suggested for obtaining the notion of the Sun's distance. A train would require 17½ days to travel round the earth at the equator, at the rate of 60 miles an hour, Secondly, work out the time required for a similar train to travel round Jupiter, viz., 181·6 days. Then do the same for the other bodies. In this way the size of each heavenly body will be well impressed.

3. Revolution round the Sun and length of Year.

(*a*) By reference to Fig 2 it will be seen that all are there shown to revolve in the same direction round the sun.

(*a*) After referring to diagram 2, it would be well to state that the movements of the system, whether of revolution or of rotation, are all in the same direction, *i.e.*, **from west to east.**

The movement of the satellites of Uranus is an exception

(*b*) The earth's year consists of the time required to make one revolution round the sun; the year of each of the other members of the system is determined in the same way, and is found to be different in every case.

(*b*) The class will know already the first half of the paragraph. Connect the second half with their previous knowledge by simple statement.

(*c*) The lengths of year reckoned in days of our earth are as follows:—

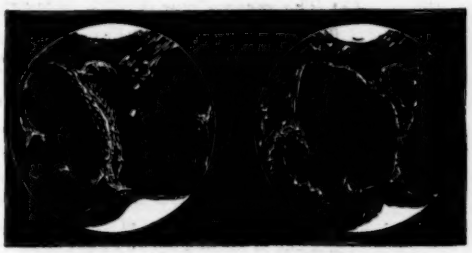
	days of our Earth		days of our Earth
Mercury	88	Jupiter	4,333
Venus	225	Saturn	10,759
Earth	365¼	Uranus	30,687
Mars	687	Neptune	60,127

(*c*) All these figures need not be learned at first. The attention of the class should be drawn (1) to the great difference in the year of those bodies outside of the planetoids from that of those nearer the sun; (2) to the similarity existing between the table of distances and this table, and thus prepare for the establishment of Kepler's 3rd law in future lessons.

4. Rotation and the Length of Day upon each member of the Solar System.

(*a*) *How known to rotate.*—By observing Mars, for instance, it is found that the patches on its surface take different positions at short intervals, and it is inferred that this is due to Mars rotating on its axis.

(*b*) *Similar movements* are observed on other members of the system.



Mars at 6 p.m. Mars at 12 p.m.

Fig. 4. Mars observed after an interval of six hours showing evidence of rotatory movement.

(*c*) *Different rates of rotation.*—These are calculated in hours of earth movement, and are as follows:—

	hours		hours
Mercury	24	Jupiter (nearly)	10
Venus	23⅓	Saturn	10¼
Earth (nearly)	24	Uranus	12
Mars	24½	Neptune	?

The similarity of the day on the heavenly bodies near the earth will at once be noted, and the great difference between their days and those of the larger bodies must be pointed out.

BLACKBOARD SKETCH.

1. The Earth revolves and rotates; and because its axis is inclined **it has changes of season.**
2. Distance of heavenly bodies shown on the diagram, fig. 2, **Mercury is nearest, and Neptune is farthest away from the Sun.**
3. The size of each is stated in the Table and illustrated by diagram. **The largest next to the Sun is Jupiter.**
4. Each member of the system revolves round the Sun in the same direction. Those furthest away have the longest year. **Neptune has a year almost 165 times as long as that of the Earth.**
5. Each also rotates, and in the same direction as the Earth. Jupiter, the largest of the group of bodies revolving round the Sun, **rotates in the least time, viz., in 10 hours.**

How to Teach School Children to Sing from Notes.

BY W. G. McNAUGHT,

Associate of The Royal Academy of Music.

Teaching Songs.—continued.

75. When the tune is familiar the words should be carefully spoken, with special attention to proper and clear pronunciation. The teacher should say the words a few at a time, the class repeating. When a verse has been repeated it is a good plan to get one or two of the clearest speakers amongst the children to say the words to the other children. Faults of pronunciation that are bad enough in ordinary speech become intensified when they are laid bare by the deliberation of utterance necessitated by the tones dwelt upon in singing. Quite apart from provincial peculiarities against which it is futile to war in singing if they are to be permitted in other lessons and in speech generally, there are common faults that should under no circumstances be tolerated. Among these faults may be mentioned:

1st. The dropping of final consonants. Thus the following words:—

'Then midst our dejection, how sweet to have earned
The blest recollection of kindness returned,'

may come out as—

'Then mist our dejection how swee to have earn
The bles recollection of kiness return.'

2nd. Saying 'in' for 'ing.'

3rd. Running the end of one word into the beginning of the next.

4th. Taking breath in the middle of a word.

5th. Using a wrong vowel in sustained sounds. Thus, singing as at (1) instead of as at (2).

(1) | d : — | — : — ||
fe-ar——————
de-ar——————
here = yer——————

(2) | d : — | — : — ||
fe——————ar
de——————ar
he——————ar

It is not necessary to go further into the subject here. A teacher can easily observe these and other faults for himself. If he is conscious that in his own speech and singing he has unfortunately contracted bad habits he should seek every assistance obtainable. Only those who have the selection of teachers know to what extent manner and good speech influence choice. Curwen's *Standard Course** provides many excellent studies in pronunciation that go quite as far as any good singer or school teacher need study in this direction.

76. It is not wise in this Division to rely solely upon the pattern teaching described in Sections 74 and 75 to fix tune and words in the memory. The songs so taught should be sung from the blackboard, from printed charts or from books. The eye in this way can be accustomed to notation, and the song can be made to pointedly illustrate the time, tune and ear studies.

77. When, after patterning as described, the class is ready to sing from the written or printed notation, it will still be found necessary to pattern the fitting of the words to the music. The use of the slur-line,

: s | s : l | s : m | r :- .d | d }
The wind ..... gent - ly whis ..... - pers,

: s | l : d' | t : l | l : ÷ | s ||
The rain ..... light - ly falls. .....

which indicates the tones that are to be sung to one syllable, should be made quite clear, and the proper phrasing of the words to bring out the sense should not be left to chance.

78. Finally, the song must be sung with *due expression.* The direct refining influence that may be reached through song cannot be hoped for if children are permitted to sing loudly and coarsely, or without attempting to sing the words with feeling and thoughtful expression. And the influence upon the amusements of after life, which it is hoped the present training of the child's tastes and feelings will exert, cannot reasonably be expected if the beautiful and touching in music is never experienced in

* Tonic Sol-Fa Agency. Price 3s. 6d.

school. When once the faculties of expression have been aroused in children they are eager to look for the picturesque effects of loud and soft, gay and grave, &c., that are appropriate to the words being sung, and they take only a formal interest in songs that are monotonously drawled through from beginning to end without the slightest attempt at expression. Teachers should make it a point to consider the expression of the songs they teach. Ingenuity and good taste will often discover effects that are not to be found on the surface.

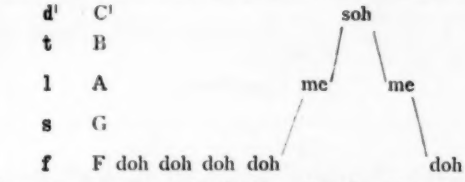
79. From the foregoing it will be obvious that the choice of songs for school use is by no means a slight matter. It is too often the case that songs are chosen for practice in the most fortuitous manner; their fitness for school purposes evidently not being in the least considered. A teacher struck with the prettiness of some song admirably performed with accompaniment at a concert (the words as likely as not dolefully describing the pangs of blighted love) or with some part-song, sung by an adult choral society, forthwith introduces the melody, minus the indispensable harmony, to a class of children, who are said to be not musical if they do not readily take to it. The present writer once heard Weiss's elaborate setting of 'The Village Blacksmith' presented as school music by a large class of boys who could not sing a few notes in tune. The song was sung without accompaniment, the key being taken again and again because of the constant flattening. In this case the choice of music rather than of words was at fault. On another occasion, when taking an eminent musician to an elementary school for the purpose of showing him the condition of music in schools of this type, we were treated to the performance of a difficult chromatic piece in three or four parts, sung atrociously out of tune by a class of boys whose ears we knew were being almost irrecoverably vitiated by the tolerance of false intonation that unfortunately comes of frequent practics of this sort. The motive of teachers in seeking to secure for their pupils the refinement and culture found in the practice of the best music deserves to be commended. The 'school music' offered for choice nowadays is only too often commonplace and weak, and, in turning away from such dull trivialities, teachers are wise. It is obvious, however, that the selection of difficult music never intended and quite unfit for the use of a school class with only moderate attainments, is no gain but rather a hindrance to progress.

80. It should be noted that the Code requirements say that five SCHOOL songs are to be prepared. The description 'school song' covers a wide field of choice. It may include an infants' song and a classical trio for treble and alto voices—'Twinkle, twinkle, little star,' and Rubinstein's duets. Strictly, a school song is one in which the music is tuneful, pretty and easily remembered, thoroughly adapted to the words in accent and feeling, and set to words that afford instruction (without being intrusively didactic) and innocent amusement, and that can be sung at home to parents. Whatever else is taught beside, it should be the teacher's care to see that songs of this type are taught to all the younger children in a school. The choice of all other music of a different type to be studied in *addition* to real school songs is entirely a matter of discretion. The rule should be—choose only that music the class can be fairly expected to master, and that the resources at disposal can perform completely as written by the composer.

81. Children in the third Standard should be taught something of absolute pitch and the pitching of keys. Attention should be drawn to the fact that in the various pieces and exercises that have been practised the key-tone *doh* has been sometimes one sound and sometimes another, higher or lower; and the teacher should inform the children that the time has now come for them to learn the names which are commonly used to describe the various sounds that can be taken for *dohs* or key tones. Much explanation of the difference between absolute pitch and relative pitch is unnecessary at this stage. It will suffice at first for the children to learn that certain sounds are known by letters of the alphabet, that when these sounds are performed in succession they form the familiar tune of the scale, and that the position of a sound in the series is called its PITCH. The alphabetical

C¹	**d¹**
B	**t**
A	**l**
G	**s**
F	**f**
E	**m**
D	**r**
C	**d**

scale of pitches should be displayed side by side with the scale of sol-fa syllables, and taking care to secure the right pitch for 'C,' the class should be practised in singing up and down the scale, using the alphabetical names until they are learnt by heart. Unless the teacher is quite assured of his ability to sing 'C' from memory (it is surprising to find so many under delusions in this connection) it is best to give the 'C' from a tuning fork, the sight, and invariable sound of which will help the class to remember what is meant by 'pitch.' When the pitch scale is familiar the class should be practised in pitching keys that fall upon 'natural' (*i.e.* not sharpened or flattened) notes. Suppose 'Key F' (*i.e. doh* to be pitched on F) is to be found. The sound of C¹ is given from the fork and the class sings down the alpabetical scale to 'F'



(knowing the tune to be **d¹ t l s f**) and calling the 'F *doh* several times, sings the chord to 'establish' the key. In pitching keys on this plan it is for some time necessary to sing the *doh* several times before singing the chord, because most of the 'natural' keys (as B, A, E, or D) are really violent and difficult transitions from the key of C just established in the ear by the descending progression. When the *doh* is high in the scale of pitch the *doh* chord should be sung, say as follows:—

d¹ C¹
t B
l A = doh doh doh. Chord. **d m d s, d.**

82. Other ways of pitching keys, chiefly useful for the teacher at present, but which may be gradually taught in upper Standards, are now described to complete the reference to the subject.

The major keys mostly used in vocal music are:—

C D E F G A (B rarely)
E♭ A♭ B♭

The practised teacher generally quickly finds any of these *dohs* (1) by observing the interval from C to the *pitch* sought for, or, by observing the tone of the scale that C forms in the *key* sought for.

Examples:—

(1) Key E. C¹ to E equals **d¹ m**. Sing **d¹ m**. Call **m**, *doh*

(2) Key A♭. C¹ = me
B♭ = ray
doh = A♭ = doh
Call C¹ *me*, and sing **m r d**

The second plan is the best for the Keys F, B♭, E♭ and A♭, when it can be adopted without uncertainty.

E¹				
E¹♭			d¹	
D¹			t	
C¹	s	r	l	m
B				
B♭	f	d		r
A	m			
A♭				d
G	r			
F	d			

83. In large schools, where Standards I. and II. are taught separately, a higher proficiency may be demanded from Standard II. than from Standard I. No specific points are mentioned, but it may be expected that great fluency in the work of Standard II., and evidences of preparation for the work of Division III., will naturally be looked for. The points in the work of Division III., that should (if possible) be taught to Standard II., are the following :—

1st. Easy leaps to and from—
ray, *fah*, *lah*, and *te*.

2nd. Three-pulse measure.

3rd. Pulse-and-a-half notes.

(| d :- .d ||)
TAA - AA TAI

4th. Whole pulse rests.

5th. Written exercises in tune.

6th. Ear tests in naming tones next to one another in scale order.

It will be convenient to deal with these points in the sections given to Division III.

(To be continued.)

—o—

Pupil Teachers' Preparation Papers.

THE half-yearly examination of pupil teachers will be held on Saturday, October 20th. By the time this magazine is in the hands of subscribers the whole of the year's work should be accomplished, and the six or seven weeks remaining should be spent in careful revision. This should be set about in a systematic way. The time at the disposal of the teacher should be properly divided, and a subject allotted to each division. No part of the work should be delayed, as it may happen that circumstances will arise to prevent the use of the time which may have been fixed for any special work.

We cannot too strongly urge on pupil teachers the necessity of careful definition. Memory work we have found to be often seriously neglected, and the result is a slipshod, inaccurate style in many examination papers. Repeating by rote has many advantages. It compels the learner to give a close attention to what has to be repeated. The memory is strengthened, and the bare facts learned, uninteresting it may be in themselves, may be made the basis of good mental work. It also accustoms the pupil to orderly arrangement of the matter to be used, and a better style of work generally is acquired.

We do not think we can too often reiterate our advice as to obtaining a knowledge of the *rationale* of every process in arithmetic. In fact this is almost the only part of this subject which can be revised, unless a key has been kept of the difficult examples worked during the year. In History, care should be taken to obtain a distinct idea of the effect of actions as seen in the development of future events. The leading events and dates of each period should be learned by heart, while a list of the prominent persons should be made, and a short description of their life and work should be known. For the map drawing exercise, a list of the principal maps with their parallels and meridians should be known. From a good atlas a table in the following fashion should be made out. Thus :—

England : Central meridian 2°. Proceed by ones. 3½ each side. Lowest parallel 50°. Six high.

Ireland : C. M. 8°. By ones. 2½ each side. L. P. 51½. Four high.

It only remains to fix the size of each degree by the usual method, and a map with correct lines of latitude and longitude would be the result. Below we give a test paper based on the pattern of previous government papers. Every pupil teacher should attempt it. It will give familiarity with the amount of work to be done. It will discount the nervousness which more or less attaches to every examination. It will find out weak points and possibly lead to their remedy. It will give practice in making a neat paper, an attainment which every one does not possess. We offer to examine any set of papers and return them free by post, with marks, notes, and comments, if sent to us at the office of *The Practical Teacher*, 4, Pilgrim Street, Ludgate Hill, London, E.C., not later than the 10th September, on receipt of a postal order for one shilling.

TEST PAPERS FOR PUPIL TEACHERS WHO ARE TO BE EXAMINED IN OCTOBER.

Directions.

1. Write on half sheets of foolscap, and on one side only.
2. At the top of each half sheet write your name in full, the full address of your school, and the year the papers of which you are taking.
3. Do not write the questions, but prefix to each answer the number of the question to which it corresponds.
4. Do not use any book or writing from which answers may be copied.
5. Keep strictly to the time allowed.
6. If you have not time to answer all the questions, choose those you can answer best ; but do not omit the whole of any one subject.
7. If you wish them examined, corrected, and valued, send them to the office of the 'PRACTICAL TEACHER,' Pilgrim Street, Ludgate Hill, together with a shilling postal order, not later than the 10th September. They will be returned post free.

END OF FIRST YEAR.

Three and a half hours allowed.

Arithmetic.

(*Do three questions only, including question 4, if you can.*)

MALES ONLY.

1. Find the L. C. M. of 110, 1,155, and 1,470. How would you show to a class that it was the L. C. M.?

2. What fraction of £1 4s. 6½d. is 6s. 7¾d., and what decimal of 2 cwt. 3 qrs. 7 lbs. is 1 cwt. 1 qr. ?

3. A German 20-mark piece is worth £·979 ; find to the nearest farthing the value of 3725·39 marks.

4. How would you show to a class by the division of a line that $\frac{3}{4} = \frac{15}{20}$, and that the difference between $\frac{3}{5}$ and $\frac{3}{4}$ is $\frac{1}{20}$?

Simplify $\frac{1\frac{1}{2}}{1\frac{2}{14}} \div [(\frac{3}{17} \times 1\frac{1}{2}) - \frac{9}{170}]$.

FEMALES ONLY.

1. Find, by practice, the value of 23 tons 6 cwt. 2 qrs. 14 lbs. at £3 13s. 4d. per ton.

2. Make out in proper form and receipt the following bill:—

12 bars of soap, each 3 lbs., at 3½ per lb.; 164 lbs. of tea at 30s. per dozen lbs; 12 packets of candles, each 6½ lbs., at 11½d. per lb.

3. Find the least sum of money which can be paid with an exact number of either sixpences, halfpennies, or dollars (a dollar = 4s. 2d.).

4. Find the G. C. M. of 53,261 and 52,779. Prove that the number you have found is the G. C. M.

Composition.

(The passage is read once by the Inspector, and you are expected to write the substance of it from memory. Read the following once yourself and then write it).

The following instance is related of the practice of economy by a dog. Dandie was a Newfoundland dog belonging to a gentleman in Edinburgh. He frequently had money given him; because, besides other interesting signs of sagacity, he would go to the baker's and buy his own bread. But Dandie received more money than his needs called for, and so he took to hoarding it. This his master discovered in consequence of the dog appearing one day with a breakfast roll when it was known no one had given him money. Search was made in the room where the dog slept, and sevenpence halfpenny was found in his bed, the dog being very excited as the servant approached his hiding place. He did not give up his saving propensities, but found a different place of concealment, and always exhibited a great dislike to the servant who had discovered his first hoard.

Grammar.

MALES AND FEMALES.

(*Answer questions* 1 *and* 2, *and one other question.*)

1. Analyse fully the following passage:—

Yet to their destined *purpose true*,
Undaunted toiled her hardy crew,
Nor looked where shelter *lay*,
Nor *for* Artornish Castle drew,
Nor steered for Aros bay.

2. Parse the words printed in italics.

3. Write out six of the ordinary terminations of English nouns and adjectives, with an example for each.

4. Show that the word *that* may be a relative pronoun, a conjunction, and an adjective; and that the word *but* may be an adverb, a conjunction, or a preposition. Make a sentence for each.

Geography.

(*Answer three questions only.*)

MALES AND FEMALES.

1. Draw a map of Australia, showing the divisions, the mountains, rivers, and chief towns.

2. Describe as fully as you can the physical characteristics of Wales.

3. Name the commercial ports of the British empire, and say what are the chief exports of each.

4. What do you know of Leeds, Sheffield, Portsmouth, Limerick, Cork, Perth, Inverness, Sydney, and Hobart Town?

History.

(*Answer two questions only.*)

1. What advantages did England derive from its occupation by the Romans and Saxons respectively?

2. Give a list of the Saxon kings from Egbert to Harold, with dates.

3. Write an account of the incursions of the Danes, or of the rise of the power of Wessex.

END OF SECOND YEAR.

FIRST PAPER.

Three and a half hours allowed.

Euclid.

MALES ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as −, +, ×.]

(*Answer two questions, including Question* 3, *if you can do so.*)

1. If from the ends of a side of a triangle there be drawn two straight lines to a point within the triangle, these two straight lines shall be together less than the other two sides of the triangle, but shall contain a greater angle.

2. The greater angle of every triangle is subtended by the greater side, or has the greater side opposite to it.

3. Define a *triangle;* show how many kinds of triangles there are according to the variation both of the angles and of the sides. In the diagram of Euclid, I., 21, by how much does the greater angle, BDC, exceed the less, BAC.

Arithmetic.

FEMALES ONLY.

(*Answer three questions only, including the last if you can.*)

1. What is a *measure*, a *common measure*, the *greatest common measure*? Find the G. C. M. of 8,214, 1,110, and 1702.

2. If I pay away ⅔ of my money, and then ⅝ of what is left, what fraction of the whole is left?

3. Reduce 4½ oz. Troy to the fraction of 5 lbs. Troy, and ⅓ of ⅝ of £4 10s. to the fraction of ⅔ of ⅛ of £1 12s. 6d.

4. What is a decimal fraction? Show as you would to a class how to convert ⅓ and ⅛ to decimal fractions. How would you explain the reason of each of these forming a recurring decimal?

Grammar.

(*Answer questions* 1 *and* 2, *and one other question.*)

MALES AND FEMALES.

1. *Our* outward life requires them not;
Then wherefore had they birth?
To minister delight to man,
To beautify the earth;
To comfort man, to whisper hope
Whene'er his faith is *dim;*
For *Who* so careth for the flowers
Will much more care for him.

Express, in your own words, the meaning of the above verses on 'Flowers.'

2. Analyse them.

3. Parse the words in italics.

4. Give the meaning of the following words, dividing them if you can into *prefix*, *root*, and *affix*, with the signification of each:—Extraction, concession, purify, nonsense, satisfaction, prelude.

Geography.

MALES AND FEMALES.

(*Answer three questions only, including the last if you can.*)

1. What are the principal towns in British India? Give as full an account as you can of the trade between India and our own country.

2. Draw, with meridians and parallels if you can, a full map of France or of Turkey. In the latter show the alterations which have been made in its area since 1854.

3. Place in order the names of the six countries in Europe with which we do the most trade, and state in each case of what the export and import trade consists.

4. Where and what are the following:—Buda-Pesth, Lyons, The Matterhorn, Snaehatten, Nijni-Novgorod, Astrakhan, Galatz, Metz.

5. Define *latitude* and *longitude*. State the difference in time between a place in 15° W. long. and one 4½° E. long., and in climate between a place 15° N. and one 50° N.

SECOND PAPER.

Two hours and a half allowed.

(One hour allowed to females for needlework, while males are engaged with arithmetic.)

Arithmetic.

MALES ONLY.

(*Answer three questions only, including the last if you can.*)

1. A banker charged 3½ per cent. on a bill for £666 13s. 4d., drawn March 2nd at eight months, and discounted on the 8th of June. Find the difference between his charge and true discount.
2. A person has £26,041 of a four per cent. stock. He saves each year a fourth of his income and invests it at 4 per cent. What is his income in the fourth year?
3. If 2 roods 15 per. cost £39 7s. 6d., what will 8 acres 17 per. cost?
4. Explain the terms *Interest*, *Profit and Loss*, and *Stock*, and find the price of the 4 per cents. when £4,680 produces £180.

History.

(*Answer three questions.*)

1. What effect had the Norman Invasion on the habits, manners, government, and language of Britain?
2. Write as fully as you can an account of the political circumstances which led to the Reformation in England.
3. What was the Feudal System? Trace its history. *Or*, write an account of Magna Charta and its chief provisions.
4. State what events are connected with three of the following places:—Worcester, Halidon Hill, Evesham, Berwick, Hedgely Moor, Hexham; also give a short account of three of the following persons:—Pym, Simon de Montfort, Warwick, Lambert Simnel, Odo, Owen Glendower.

Teaching.

(*Answer two questions only.*)

1. How many lines are needed in a single copy to teach young children with the greatest ease the forms, proportions, and the method of joining letters? Rule a specimen, and write the word *bicuspid* in it.
2. State the method you have used in correcting mistakes in reading. How have you endeavoured to secure expressive and intelligent reading? If you have read to the class yourself state your reasons for doing so.
3. How do you teach spelling (*a*) to infants, *or* (*b*) to the older scholars? What are the various advantages attached to your method?

END OF THIRD YEAR.

FIRST PAPER.

Three and a half hours allowed.

Euclid.

MALES ONLY.

(*Answer two questions, including question* 3, *if you can do so.*)

1. To describe a square on a given finite straight line.
2. To a straight line to apply a parallelogram which shall be equal to a given rectilineal figure, and having one of its angles equal to a given rectilineal angle.
3. Show how to divide a square into four equal portions by lines drawn from any point in one of its sides.

Algebra.

(*Answer three questions, including question* 4, *if you can do so.*)

1. How would you explain to a class the method of subtraction in algebra. From $x + 2y + 4z$ take $-3x + y - z$, as an example.
2. Express algebraically that if $a - b$ be divided by the square of $4\,a^7\,b^3$, the quotient is x; and simplify $\frac{\frac{1}{11}\,m^3\,n^4\,x^9}{\frac{1}{12}\,m^2\,n^5\,x^2}$
3. Form expressions for x by removing brackets, and simplifying the following:—

$$x = [(a - \sqrt{ab} + b)(a + \sqrt{ab} + b)] - (a^2 + b^2)(a^4 - a^3\,b^3 + b^4)$$

4. If $l + m = n$, show that $m^2 - n^2 + 2\,bm + b^2 = 0$, and solve the equation:—

$$\frac{4x - 15}{x - 3\frac{1}{2}} + \frac{10x - 8}{2x - 2} = \frac{8x - 26}{2x - 6} + \frac{5x - 1\frac{1}{2}}{x - \frac{1}{2}}$$

Mensuration.

(*Answer one question.*)

1. The base of a triangle is 14 inches, and its height 18 inches. What is the area of the triangle? The area of another triangle is 81 square inches, and its base 36 inches. What is the height of the triangle?
2. What would be the area of a square sheet of paper if two corners were cut off, making the sides 12, 7½, 9, 5, 5½, and 5¼ inches long respectively, when the length of the perpendicular drawn from the centre to each of the sides is 6 inches long?

Arithmetic.

FEMALES ONLY.

(*Answer three questions only, including the last if you can.*)

1. Simplify $(5{\cdot}634 \times {\cdot}0057) + \left(\frac{4{\cdot}2325}{8465} \div \frac{{\cdot}39424}{5632}\right)$
2. Reduce ⅞ of 21s. to the decimal of £1.
3. A person, after paying 7d. in the pound income tax, has £349 10s. left. What was his gross income?
4. How do you explain to a class the meaning of a recurring decimal? Show, in decimals, the difference between ⅓ and ⅓.

Grammar.

MALES AND FEMALES.

(*Answer three questions only.*)

1. *Be* not *deceived; if* I *have veiled* my look,
I turn the trouble of my countenance
Merely upon myself. *Vexed* I am
Of *late* with passions of some difference,
Conceptions only proper to myself,
But *let* not therefore my good friends *be grieved*—
Among which number, Cassius, *be* you *one*—
Nor construe any further my neglect,
Than that poor Brutus, with himself at war,
Forgets the shows of love to *other* men.

Paraphrase the above passage from a speech of Brutus in Shakespeare's 'Julius Cæsar.'

2. Parse the words in italics.
3. Analyse the first six lines.
4. Arrange the words of the lines in three divisions.—English, Latin, and Other Languages—and give the roots, prefixes and affixes of the Latin words.

Geography.

MALES AND FEMALES.

(*Answer three questions only, including the last, if you can.*)

1. What are the chief products, divisions, rivers and towns of Siberia?
2. Write as full an account as you can of Japan.
3. Where are the following, and for what are they noted:—Mandalay, Tonquin, Hong Kong, Tokio, Jeddah, Mecca, Suez, Pietermaritzburg, Nyassa, Kimberley?
4. What is the Gulf Stream? Trace its origin, course and effects. Name also the chief currents found in the ocean.

SECOND PAPER.

(*Two hours and a half allowed.*)

[One hour allowed to Females for Needlework while Males work Arithmetic.]

Arithmetic.

MALES ONLY.

(*Answer three questions only, including the last, if you can.*)

1. The area of a square garden is 4 roods 1 per. 29 yds. 6¾ ft.; find the length of a side.
2. A sum of £50,000 for drainage purposes has to be raised from four townships A, B, C, D. A is rated at £175,002, B is rated at £82,434, C is rated at £22,116, and D is rated at £204,448. How much in the £ must the rate be, and what will each township have to pay?
3. If sugar can be bought at £3 14s. per cwt. how must it be sold to gain 12½ per cent., after allowing a discount of 7½ per cent.?
4. Explain the meaning of *Stock*. The difference between the incomes derived from investing a certain sum in 5 per cent. stock at 127, and in 5½ per cent. stock at 135 is £4 14s. Find the amount invested and the income resulting from each.

History.

MALES AND FEMALES.

(Answer three questions only.)

1. Give in order, with dates, the principal events connected with the War of American Independence.
2. What led to the Union of the Parliaments of England and Scotland? State as fully as you can the advantages derived by each country from the Union.
3. Write a short account of three of the following:—Warren Hastings, the Duke of Wellington, Tippoo Saib, Lord Clive, Richard Cromwell, General Havelock.
4. Say what you know of the Corn Laws, and mention any other fiscal reforms of the present reign.

Teaching.

MALES AND FEMALES.

(Answer two questions only.)

1. Write out notes of a lesson on one of the following subjects: (*a*, for older scholars) Winds; (*b*, for infants) The Ox.
2. What are the principal groups of facts you would teach to the Third Standard in Geography? On which would you lay most stress, and why?
3. Give a list of the varied occupations you employ in the Infant School and say what advantage you expect the children to derive from them.
4. What illustrations do you use to show the various uses of the verb?

END OF FOURTH YEAR.

FIRST PAPER.

(Three and a half hours allowed.)

Euclid.

MALES ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation* as +, −, ×.]

(Answer two questions only, including No. 3 if you can).

1. In obtuse angled triangles, if a perpendicular be drawn from either of the acute angles to the opposite side produced, the square on the side subtending the obtuse angle is greater than the squares on the sides containing the acute angles by twice the rectangle contained by the side upon which, when produced, the perpendicular falls, and the straight line intercepted between the perpendicular and the obtuse angle.
2. To describe a square that shall be equal to a given rectilineal figure.
3. Prove geometrically that if a straight line be trisected the square on the whole line equals nine times the square on a third part of it.

Algebra.

(Answer three questions, including 1 and 4 if you can.)

1. Find the G.C.M. of $4a^2 + 8 + \frac{4}{a^2}$, $a^2 - \frac{1}{a^2}$, $a^2 + 1 + \frac{3}{a} + 3a$.

Find the L.C.M. of $120x^3 + 78x^2 - 45x - 27$, $120x^3 + 98x^2 - 42x - 36$, and $20x^2 + 3x - 9$.

2. Express in its simplest form—

$$\left[\left(1 + \frac{b^2}{a^2}\right)^2 - \left(1 - \frac{b^2}{a^2}\right)^2\right]^{\frac{1}{2}} - b + \frac{b(a^2 - 1)}{a^2\left(1 + \frac{1}{a}\right)}$$

3. Find the square root of $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$.
4. Solve the equations:—

$$(a)\quad x^2 + \sqrt{x^2 - 5} = 11.$$
$$(b)\quad 4xy = a^2 - b^2.$$
$$2(x^2 + y^2) = a^2 + b^2.$$

Mensuration.

(Answer one question.)

1. The area of a circular plot of grass is 100 square yards; find the area of the inscribed square.
2. The two parallel chords of a zone are 16 and 12, and their perpendicular distance is 2; what is the area of the zone.

Arithmetic.

FEMALES ONLY.

(Answer three questions.)

1. How should I affect my income by selling out from the $1\frac{3}{4}$ per cents. at $47\frac{1}{4}$, and investing in the $3\frac{1}{2}$ at 99?
2. A pays £9 3s. 4d. more rates than B though their incomes are the same: living in different towns they are rated at 2s. and 1s. 4d. in the £ respectively; what is their income?
3. In gunpowder 75 parts by weight are saltpetre, 10 parts sulphur, and 15 parts charcoal. How many pounds weight of each ingredient are used in the manufacture of 16 cwt. of gunpowder?
4. A gallon of water weighs 10 lbs., and a cubic foot of water weighs 1,000 ozs.; how many gallons are there in a cubic foot.

Grammar.

MALES AND FEMALES.

(*Answer questions 1 and 4, and one other question.*)

1. *But yesterday* the word of Cæsar *might*
Have stood against the world; now lies he here,
And *none so poor to do him reverence.*
O masters! *if* I were disposed to stir
Your hearts and minds to mutiny and rage,
I should do Brutus *wrong*, and Cassius wrong,
Which you all know are honourable men;
I will not do them wrong: I rather choose
To wrong the dead, to wrong myself and you,
Than I will wrong such honourable men.

Express in your own words the meaning of the above passage.

2. Pick out the Latin words and give their meaning and derivation.
3. Analyse the first six lines.
4. Parse the words in italics.
5. Write a short life of Shakespeare, Milton, Locke, Bacon, Sir Walter Scott, Byron, or Burns, and give a list of the works of any one of the others.

Geography.

MALES AND FEMALES.

(Answer three questions.)

1. Write what you know about the sun under the following heads: Size, position, surface, its revolution, its spots.
2. What do you know about the climate of various parts of America?
3. Define the terms: Zenith, nadir, horizon, aphelion, perihelion, planet, asteroids, solstice, equinox.
4. State as many particulars as you can about Cairo, Valparaiso, Lima, Cotopaxi, Monte Video, St. Louis, Chicago, Adrianople, Varna, Sydney.

SECOND PAPER.

(Two hours and a half allowed.)

[One hour allowed to Females for Needlework while Males are engaged with Arithmetic.]

Arithmetic.

MALES ONLY.

(Answer three questions.)

1. A monkey, climbing up a greased pole, ascends three feet and slips down 2 feet in alternate seconds until he reaches the top of the pole. If the pole be 60 feet high, how long will it take him to reach the top?
2. During a distillation the fluid that comes over in 3 consecutive hours contains 53, 50, and 48 per cent. of alcohol respectively. The rates at which it comes over during these three hours are in the ratios of 1, 2, and 3. What is the percentage of alcohol in the whole mixture?
3. Find the difference between the present values of £808 10s. due 2 years hence, according as simple or compound interest is reckoned, money being worth 5 per cent.
4. A man buys eggs at a certain price per score and sells them at half that price per doz.; what is his gain or loss per cent.?

History.

MALES AND FEMALES.

(*Answer three questions only.*)

1. Name with dates the chief events of Victoria's reign.

2. Give an account of the various Reform Bills of this century, and state the changes they have effected.

3. What historical events are connected with the following places:—Utrecht, Bunker's Hill, Crecy, Hastings, Worcester, Dunbar, Waterloo, Ramilies, Quebec?

4. Who were the chief writers of Elizabeth's reign? What period is spoken of as the 'Augustan age of English Literature'? Why?

Teaching.

MALES AND FEMALES.

(*Answer two questions only.*)

1. Write full notes of a lesson on one of the following:—
   (*a*) The Cotton Plant.
   (*b*) English Fruit Trees.
   (*c*) The Moods of Verbs.
   (*d*) For Infants.—A Country Walk.
   (*e*) For Infants.—The Herring.

2. Give a list of the combinations of letters which present difficulty to a child owing to their varied pronunciation in different words. Give specimen words.

3. Show how you teach subtraction to young children.

4. For what purpose do you give Object Lessons? State the various kinds of lessons you give for developing the various faculties of a child.

Tests in Mental Arithmetic.

STANDARD I.

1. What are 4 plus 5 plus 6? 15. Ans.
2. What is the half of 15? 7½. Ans.
3. Take twice six from three times seven. 9. Ans.
4. If I give 6 boys 8 apples each, how many shall I give away? 48. Ans.
5. How much would they cost at 4 a penny? 1s. Ans.
6. 8 × 5 − 30. 10. Ans.
7. How many boots make 7 pairs? 14. Ans.
8. What does fourteen mean? Four and ten. Ans.
9. How many quarters can I get from 5 apples? 20. Ans.
10. I had a score of apples, and gave a dozen away; how many had I left? 8. Ans.
11. A boy had 30 nuts: to how many of his playmates could he give 4 each? 7. Ans.
12. How many would he have left? 2. Ans.
13. How many penny books can I get for 2s. 2d.? 26. Ans.
14. Which of these two figures represents the larger number? 2. Ans.
15. Find the cost of 3 pounds of sugar at 2½d. per pound. 7½d. Ans.
16. What change would you receive out of a shilling? 4½d. Ans.
17. How many pounds of sugar at 3d. a pound can I get for 1s. 6d.? 6. Ans.
18. What is the difference between six sixpences and half-a-crown? 6d. Ans.
19. What gold coin can you get for two crowns? Half-a-sovereign. Ans.
20. Find the cost of a pound and a half of beef at 9d. a pound. 1s. 1½d. Ans.

STANDARD II.

1. What is the quarter of 7, 8, and 9? 6. Ans.
2. A butcher has 2 score sheep; he sells 15 and kills 11; how many has he left? 14. Ans.
3. There are 8 desks and 7 boys in a desk; how many boys are there altogether? 56. Ans.
4. How many boys will be left after 3 rows have been dismissed? 35. Ans.
   (Note.—5 rows of 7 each would be left).
5. I give 7 boys 7 marbles each, and have one left; how many had I at first? 50. Ans.
6. 17 + 5 ÷ 11 × 9 − 4 ÷ 7. 2. Ans.
7. There are 20 rooks in a tree; a farmer shoots a quarter of them; how many are left? 15. Ans.
8. What do you call the number which is made up of nine tens? Ninety. Ans.
9. How many shillings are equal to 90 pence? 7½. Ans.
10. How many twopenny buns can you get for 7s. 6d.? 45. Ans.
11. What is the cost of half-a-dozen oranges at two for 1½d.? 4½d. Ans.
12. How many farthings is that? 18. Ans.
13. Find the cost of 7 lbs. of bacon at 8d. a pound. 4s. 8d. Ans.
14. What change would be received out of a sovereign? 15s. 4d. Ans.
15. How many ounces are there in a pound-and-a-half of beef? 24. Ans.
16. How many days are there in September? 30. Ans.
17. If a boy save a penny a day what will he save in a month? 2s. 4d. Ans.
18. How many minutes are there in an hour-and-a-half? 90. Ans.
19. Find the price of half-a-pound of tea at half-a-crown a pound. Give the answer in farthings. 60. Ans.
20. How many walnuts at 8 a penny could you get for 8½d.? 68. Ans.

STANDARD III.

1. What is ten times 75? 750. Ans.
2. How many more is required to make a thousand? 250. Ans.
3. What is the amount of a thousand farthings? £1 0s. 1od. Ans.
4. How many apples must be cut up to give 26 girls a quarter each? 7. Ans.
5. What part of an apple would be left? ¼. Ans.
6. How old is a boy this year who was born in 1879? 9 years. Ans.

7. What is the half of half-a-guinea?
5s. 3d. Ans.

8. How many pence are there in half-a-guinea?
126. Ans.

9. Which of these figures represents the largest number? 1. Ans.

10. What would 5 dozen apples cost at a halfpenny each? 2s. 6d. Ans.

11. From £5 take 7 times 5s. £3 5s. Ans.

12. Find the price of 4½ lbs. of mutton at 10d. a pound. 3s. 9d. Ans.

13. What is the cost of ¾ lb. of butter at 1s. 8d. a pound? 1s. 3d. Ans.

14. Take 1s. 3d. from half-a-sovereign.
8s. 9d. Ans.

15. A person bought 80 eggs at 1s. 3d. a score; how much did they cost? 5s. Ans.

16. Find the cost of a gallon of milk at 2d. a pint.
1s. 4d. Ans.

17. How many hours are there in a week?
168. Ans.

18. How many days are there in 2 years?
730. Ans.

19. If a boy earn sixpence every day, how much will he get for the month of September?
15s. Ans.

20. What is the cost of 3 stone of potatoes at a penny a pound? 3s. 6d. Ans.

STANDARD IV.

1. How many less than a hundred is 4 times 19?
24. Ans.

2. Divide 200 nuts equally among 17 boys and 23 girls; how many is that for each? 5. Ans.

3. I bought 7 lbs. of butter at 1s. 3d. per lb., and sold it at 1s. 8d.; how much did I gain?
2s. 11d. Ans.

4. Find the cost of 9 lbs. of beef at 9½d. per lb.
8s. 1½d. Ans.

5. What change would be received out of a sovereign? 11s. 10½d. Ans.

6. How many half-crown hats can be bought for £3 12s. 6d.? 29. Ans.

7. How much is ⅘ of a sovereign? 16s. Ans.

8. What change would you get out of a crown after buying 16 eggs at 1s. 6d. a dozen? 3s Ans.

9. A horse runs a mile in 3 minutes; how far could it go in an hour and a quarter at the same rate?
25 miles. Ans.

10. How many minutes has a boy been over his sums who takes from 2.45 to 3.25? 40. Ans.

11. Find the price of 3 gross of buttons at 4½d. per dozen. 13s. 6d. Ans.

12. What part of a foot is half-an-inch. $\frac{1}{24}$. Ans.

13. If I run 220 yards in a minute, how long will it take to run a mile? 8 minutes. Ans.

14. How many stone are there in half-a-cwt.?
4. Ans.

15. What is the cost of a cwt. of sugar at 3d. a pound? £1 8s. Ans.

16. Divide the quarter of £1 8s. among 16 boys; how much is that for each? 5¼d. Ans.

17. If two ounces of pepper cost 3½d., what does it cost a pound? 2s. 4d. Ans.

18. If seven sheep cost £21, what will 5 cost?
£15. Ans.

19. What is the area of a ceiling in square yards, which is 15 ft. long and 12 ft. broad? 20. Ans.

20. What would it cost whitewashing at a halfpenny a square foot? 7s. 6d. Ans.

STANDARD V.

1. Take the square of 9 from the square of 10.
19. Ans.

2. What is the G.C.M. of 72 and 96? 24. Ans.

3. Find the L.C.M. of 2, 3, 4, 5, and 6.
60. Ans.

4. Which is greater, $\frac{1}{6}$ or $\frac{1}{7}$? $\frac{1}{6}$. Ans.

5. What is the difference? $\frac{1}{42}$. Ans.

6. Take $\frac{1}{3}$ from $\frac{3}{4}$. $\frac{5}{12}$. Ans.

7. What fraction of a florin is 8d.? $\frac{1}{3}$. Ans.

8. I give 16 girls a third of an apple each; how many apples must I cut up? 6. Ans.

9. How much should I have left? $\frac{2}{3}$. Ans.

10. How many twelfths are there in $\frac{2}{3}$? 8. Ans.

11. After spending $\frac{5}{7}$ of my money, what fraction have I left? $\frac{2}{7}$. Ans.

12. If I have half-a-crown left, how much had I at first? 8s. 9d. Ans.

13. What is the difference between $\frac{5}{8}$ of half-a-crown and $\frac{5}{6}$ of a florin? 2d. Ans.

14. Find the cost of 3 tons 5 cwt. at 10s. a ton.
£1 12s. 6d. Ans.

15. If 9 horses are worth £225, how many horses could I get for £100? 4. Ans.

16. If 6 horses plough a field in five days, how long will it take 4 horses? 7½ days. Ans.

17. Find the simple interest on £200 for 3 years at 4 per cent. £24. Ans.

18. What is the simple interest on £450 at 3½ per cent. for 2 years? £31 10s. Ans.

19. I bought a horse for £50, and sold it to gain 50 per cent.; how much did I get for it?
£75. Ans.

20. A piano, which cost £30, was sold at a loss of 20 per cent.; what was received for it?
£24. Ans.

STANDARDS VI. AND VII.

1. I give ⅓ of an apple to Harry, ⅛ to John, and the rest to Will; what is Will's share? $\frac{7}{11}$. Ans.

2. How many tenths are there in $13\frac{3}{5}$?
136. Ans.

3. Which is greater, ·5 or ·35? ·5. Ans.

4. What is the difference? ·15. Ans.

5. What vulgar fraction is equal to this decimal?
$\frac{3}{20}$. Ans.

6. Which is greater, ·47 or ·470?
Both alike. Ans.

7. What is the difference between ·4 and $\dot{4}$?
·04. Ans.

8. Express the difference as a vulgar fraction in its lowest terms. $\frac{3}{475}$. Ans.

9. Multiply ·0705 by 100. 7·05. Ans.

10. Find the value of ·975 of £1.
19s. 6d. Ans.

11. What is the value of ·428571 of half-a-guinea?
4s. 6d. Ans.

12. What decimal of a shilling is 7½d.?
·625. Ans.

13. Find the simple interest on £250 for 6 months at 2½ per cent.
£3 2s. 6d. Ans.

14. What is 5 per cent. on £567 8s. 9d.
£28 7s. 5¼d. Ans.

15. An agent is paid 5 per cent. commission, and receives £14 9s. 6d.; how much has he collected?
£289 10s. Ans.

16. In what time will a sum of money double itself at 4 per cent.?
25 years. Ans.

17. What is the area of a square room in square yards, which is 60 ft. round?
25. Ans.

18. If I bought a knife for 9d., and sold it for 1s., what did I gain per cent.?
33⅓. Ans.

19. If I bought it for 1s., and sold it for 9d., what did I lose per cent.?
25. Ans.

20. In a school of 450 children 96 per cent. passed in reading; how many failed?
18. Ans.

London University Matriculation.

THE following new instructions respecting the mode of entry for the matriculation examination in the University of London will be read with great interest by those of our readers who intend to pass that examination.

The registrar gives notice that in view of the rapidly increasing number of candidates for the examinations of the university, all candidates for matriculation will henceforth be required to comply with the following instructions:—

1. Not less than five weeks before the commencement of the examination every candidate must apply to the registrar by letter for a *Form of Entry*, which, together with all particulars respecting the arrangements of the examination, will be sent to him immediately on receipt of the application.

2. This form, duly filled up, must be returned to the registrar *not less than four weeks* before the commencement of the examination, and with it, *in the same cover*, must be sent (*a*) the candidate's *certificate of age*, and (*b*) his fee for the examination.

No candidate's name will be placed on the list of candidates unless his *form of entry*, *certificate of age*, *and fee* shall have been received at the university *on or before the fourth* Monday before the commencement of the examination.

As soon as possible after the closing of the list, and not previously, each candidate's certificate and fee will be acknowledged, his certificate will be returned, and a number, by which he is to be designated throughout the examination, will be assigned to him.

EXAMINERS IN THE UNIVERSITY OF LONDON, 1888.

Latin.—Prof. R. Y. Tyrrell, D.Lit., LL.D., and Prof. A. S. Wilkins, Litt.D., LL.D.

Greek.—Rev. H. A. Holden, LL.D., M.A., and Rev. W. Wayte, M.A.

English.—Prof. E. Arber, and Henry Craik, Esq., M.A.

French.—Rev. E. Brette, B.D., and A. Esclangon, Esq.

German.—Prof. Buchheim, Ph.D., and Herman Hager, Ph.D.

Mental and Moral Science.—Prof. Adamson, LL.D., and Prof. Knight, M.A.

Political Economy.—Prof. C. E. Bastable, M.A., and Prof. I. S. Nicholson, D.Sc., M.A.

Physics.—Prof. FitzGerald, M.A., F.R.S., and R. T. Glazebrook, M.A.

Chemistry.—Prof. J. E. Reynolds, M.D., and Prof. W. A. Tilden, D.Sc.

Mathematics.—Prof. M. J. M. Hill, M.A., and J. Larmor, M.A., D.Sc.

Botany.—Prof. O. Bower, M.A., and Prof. H. M. Ward, M.A.

Zoology.—Prof. E. Ray Lankester, M.A., and Adam Sedgwick, M.A.

Geology.—Prof. T. G. Bonney, D.Sc., and Prof. W. Boyd Dawkins, M.A.

Physiology.—Prof. J. N. Langley, M.A., and Prof. Schäfer.

Publications Received.

Bell, G., and Sons—
Greek Testament Selections. By A. M. M. Stedman, M.A.
The Building of the British Isles. By A. J. Jukes-Browne, B.A., F.G.S.
The Cambridge Texts, with Notes:—
Virgil's Æneid, Books 1 & 2.
,, Georgics, Books 1 and 2, 3 and 4.
,, Bucolics.
Ovid's Fasti, Books 1 and 2, 3 and 4.

Blackie and Son—
Earth Knowledge. Part II. By W. Jerome Harrison and H. Rowland Wakefield.
Whisk and Buzz. By Mrs. A. H. Garlick.
Ablett's Drawing Series for the Standards.

Chambers, W. and R.—
Our Animal Friends.

Curwen, J., and Sons—
The School Music Teacher. By John Evans and W. G. McNaught.
The Call to Song. By J. Evans and A. L. Cowley.

Educational Supply Association, The—
Twelve Rules for helping English people to remember French Genders.

Heywood, John—
Lamb's Tales from Shakespeare. By A. Gardiner.
Second Grade Perspective, Parts 11 and 12. By G. O. Blacker.

Hirschfeld Bros.
Hossfeld's New Method for Learning the Spanish Language. By Tomas Enrique Gurrin.

Marcus Ward & Co.—
The Oriel Geographical Reader. Standard II.

National Society, The—
A Summary of the Final Report of the Royal Commission, 1886—1888. By E. Herbert Lyon.

Nelson, T., and Sons—
The Royal Star Arithmetic Cards. Standards I. to VII.
The Royal Upper Class Readers—Great Authors.

Sonnenschein and Co.—
The Cyclopædia of Education. Parts 6 and 7.

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

Algebra.

1. J. D. M.—Prove that

$$C_1 - \frac{C_2}{2} + \frac{C_3}{3} - \ldots + (-1)^{n+1}\frac{Cn}{n} = 1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{n}.$$

Let $d_1, d_2, d_3, \ldots d_n$ represent the first differences of the series

$$1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{n};$$

$$d_1 = -\tfrac{1}{2};$$

$$d_2 = \frac{1.2}{1.2.3} = \tfrac{1}{3};$$

$$d_3 = -\frac{1.2.3}{1.2.3.4} = -\tfrac{1}{4};$$

&c., &c.

$$d_{n-1} = (-1)^{n+1}\frac{1.2.3\ldots(n-1)}{1.2.3\ldots n} = (-1)^{n+1}\frac{1}{n}.$$

The $(n+1)$th term of series

$$0,\ 1,\ (1+\tfrac{1}{2}),\ (1+\tfrac{1}{2}+\tfrac{1}{3}),\ldots\left(1+\tfrac{1}{2}+\tfrac{1}{3}+\ldots+\frac{1}{n}\right)$$

is the sum of $1, \frac{1}{2}, \frac{1}{3}, \ldots \frac{1}{n}$.

The first order of differences of

$$0,\ 1,\ (1+\tfrac{1}{2}),\ (1+\tfrac{1}{2}+\tfrac{1}{3}),\ldots\left(1+\tfrac{1}{2}+\tfrac{1}{3}+\ldots+\frac{1}{n}\right)$$

is the series $1, \frac{1}{2}, \frac{1}{3}, \ldots \frac{1}{n}$;

If $D_1, D_2, D_3, \ldots D_n$ represent the first differences of the above series,

$$\therefore D_2 = d_1,\ D_2 = d_2, \ldots D_n = d_{n-1};$$

The $(n+1)$th term of the above series, putting a for first term

$$= a + D_1 n + D_2\frac{n(n-1)}{1.2} + D_3\frac{n(n-1)(n-2)}{1.2.3} + \ldots + D_{n-1}n + Dn$$

(But $a = 0$, $D_1 = 1$, $D_2 = d_1 = -\frac{1}{2}$, $D_3 = d_2 = \frac{1}{3}, \ldots$ $D_n = d_{n-1} = (-1)^{n+1}\frac{1}{n}$)

$$= n - \frac{n(n-1)}{1.2}\times\tfrac{1}{2} + \frac{n(n-1)(n-2)}{1.2.3}\times\tfrac{1}{3} - \ldots + (-1)^{n+1}\frac{1}{n}$$

$$= C_1 - C_2\times\tfrac{1}{2} + C_3\times\tfrac{1}{3} - \ldots + (-1)^{n+1}C_n\times\frac{1}{n};$$

$$\therefore C_1 - \frac{C_2}{2} + \frac{C_3}{3} - \ldots + (-1)^{n+1}\frac{Cn}{n} = 1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{n}.$$

Q. E. D.

2. 4th YEAR P. T.—From each of a number of gold coins a person filed a fifth part, and had passed $\frac{4}{5}$ of them, gaining thereby 52s. 6d., when the rest were seized as light coin, except one with which the man decamped, having lost on the whole $\frac{4}{5}$ as much as he had gained before; how many coins were there at first?

Gain on each coin passed = $\frac{1}{5}$ of its value,
Loss ,, ,, seized = $\frac{4}{5}$,, ;

$$\therefore \left(\frac{2x}{5} - 1\right)\times\tfrac{4}{5} = (1+\tfrac{4}{5})\left(\frac{3x}{5}\times\tfrac{1}{5}\right)$$

$$\frac{4(2x-5)}{25} = \tfrac{9}{5}\times\frac{3x}{25}$$

$$= \frac{7x}{25}$$

$$8x - 20 = 7x$$

$$8x - 7x = 20$$

$$\therefore x = 20.$$

$\therefore$ No. of coins = 20. Ans.

3. FELIX.—Given $\frac{a^2x}{1-a\sqrt{x}} = \frac{a}{\sqrt{x}} + \frac{1}{1-a\sqrt{x}}$, to find value of x.

$$\frac{a^2x}{1-a\sqrt{x}} = \frac{a}{\sqrt{x}} + \frac{1}{1-a\sqrt{x}}$$

$$-\frac{a}{\sqrt{x}} = \frac{1-a^2x}{1-a\sqrt{x}}$$

$$= \frac{(1+a\sqrt{x})(1-a\sqrt{x})}{1-a\sqrt{x}}$$

$$= 1 + a\sqrt{x}$$

$$-a = \sqrt{x} + ax$$

$$ax + \sqrt{x} = -a$$

$$x + \frac{\sqrt{x}}{a} = -1$$

$$x + \frac{\sqrt{x}}{a} + \left(\frac{1}{2a}\right)^2 = \frac{1}{4a^2} - 1$$

$$= \frac{1-4a^2}{4a^2}$$

$$\sqrt{x} + \frac{1}{2a} = \frac{\pm\sqrt{1-4a^2}}{2a}$$

$$\sqrt{x} = \frac{\pm\sqrt{1-4a^2}-1}{2a}$$

$$\therefore x = \left\{\frac{\pm\sqrt{1-4a^2}-1}{2a}\right\}^2.$$

Or, $x = \dfrac{1-4a^2\pm 2\sqrt{1-4a^2}+1}{4a^2}$

$$= \frac{2-4a^2\pm 2\sqrt{1-4a^2}}{4a^2}$$

$$= \frac{(1-2a^2)\pm\sqrt{1-4a^2}}{2a^2}$$

10. Find the value of ·975 of £1.
19s. 6d. Ans.

11. What is the value of ·428571 of half-a-guinea?
4s. 6d. Ans.

12. What decimal of a shilling is 7½d.?
·625. Ans.

13. Find the simple interest on £250 for 6 months at 2½ per cent. £3 2s. 6d. Ans.

14. What is 5 per cent. on £567 8s. 9d.
£28 7s. 5¼d. Ans.

15. An agent is paid 5 per cent. commission, and receives £14 9s. 6d.; how much has he collected?
£289 10s. Ans.

16. In what time will a sum of money double itself at 4 per cent.? 25 years. Ans.

17. What is the area of a square room in square yards, which is 60 ft. round? 25. Ans.

18. If I bought a knife for 9d., and sold it for 1s., what did I gain per cent.? 33⅓. Ans.

19. If I bought it for 1s., and sold it for 9d., what did I lose per cent.? 25. Ans.

20. In a school of 450 children 96 per cent. passed in reading; how many failed? 18. Ans.

London University Matriculation.

THE following new instructions respecting the mode of entry for the matriculation examination in the University of London will be read with great interest by those of our readers who intend to pass that examination.

The registrar gives notice that in view of the rapidly increasing number of candidates for the examinations of the university, all candidates for matriculation will henceforth be required to comply with the following instructions:—

1. Not less than five weeks before the commencement of the examination every candidate must apply to the registrar by letter for a *Form of Entry*, which, together with all particulars respecting the arrangements of the examination, will be sent to him immediately on receipt of the application.

2. This form, duly filled up, must be returned to the registrar *not less than four weeks* before the commencement of the examination, and with it, *in the same cover*, must be sent (*a*) the candidate's *certificate of age*, and (*b*) his fee for the examination.

No candidate's name will be placed on the list of candidates unless his *form of entry*, *certificate of age*, *and fee* shall have been received at the university *on or before the fourth* Monday before the commencement of the examination.

As soon as possible after the closing of the list, and not previously, each candidate's certificate and fee will be acknowledged, his certificate will be returned, and a number, by which he is to be designated throughout the examination, will be assigned to him.

EXAMINERS IN THE UNIVERSITY OF LONDON, 1888.

Latin.—Prof. R. Y. Tyrrell, D.Lit., LL.D., and Prof. A. S. Wilkins, Litt.D., LL.D.

Greek.—Rev. H. A. Holden, LL.D., M.A., and Rev. W. Wayte, M.A.

English.—Prof. E. Arber, and Henry Craik, Esq., M.A.

French.—Rev. E. Brette, B.D., and A. Esclangon, Esq.

German.—Prof. Buchheim, Ph.D., and Herman Hager, Ph.D.

Mental and Moral Science.—Prof. Adamson, LL.D., and Prof. Knight, M.A.

Political Economy.—Prof. C. E. Bastable, M.A., and Prof. I. S. Nicholson, D.Sc., M.A.

Physics.—Prof. FitzGerald, M.A., F.R.S., and R. T. Glazebrook, M.A.

Chemistry.—Prof. J. E. Reynolds, M.D., and Prof. W. A. Tilden, D.Sc.

Mathematics.—Prof. M. J. M. Hill, M.A., and J. Larmor, M.A., D.Sc.

Botany.—Prof. O. Bower, M.A., and Prof. H. M. Ward, M.A.

Zoology.—Prof. E. Ray Lankester, M.A., and Adam Sedgwick, M.A.

Geology.—Prof. T. G. Bonney, D.Sc., and Prof. W. Boyd Dawkins, M.A.

Physiology.—Prof. J. N. Langley, M.A., and Prof. Schäfer.

Publications Received.

Bell, G., and Sons—
Greek Testament Selections. By A. M. M. Stedman, M.A.
The Building of the British Isles. By A. J. Jukes-Browne, B.A., F.G.S.
The Cambridge Texts, with Notes:—
Virgil's Æneid, Books 1 & 2.
,, Georgics, Books 1 and 2, 3 and 4.
,, Bucolics.
Ovid's Fasti, Books 1 and 2, 3 and 4.

Blackie and Son—
Earth Knowledge. Part 11. By W. Jerome Harrison and H. Rowland Wakefield.
Whisk and Buzz. By Mrs. A. H. Garlick.
Ablett's Drawing Series for the Standards.

Chambers, W. and R.—
Our Animal Friends.

Curwen, J., and Sons—
The School Music Teacher. By John Evans and W. G. McNaught.
The Call to Song. By J. Evans and A. L. Cowley.

Educational Supply Association, The—
Twelve Rules for helping English people to remember French Genders.

Heywood, John—
Lamb's Tales from Shakespeare. By A. Gardiner.
Second Grade Perspective, Parts 11 and 12. By G. O. Blacker.

Hirschfeld Bros.
Hossfeld's New Method for Learning the Spanish Language. By Tomas Enrique Gurrin.

Marcus Ward & Co.—
The Oriel Geographical Reader. Standard II.

National Society, The—
A Summary of the Final Report of the Royal Commission, 1886—1888. By E. Herbert Lyon.

Nelson, T., and Sons—
The Royal Star Arithmetic Cards. Standards I. to VII.
The Royal Upper Class Readers—Great Authors.

Sonnenschein and Co.—
The Cyclopædia of Education. Parts 6 and 7.

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

Algebra.

1. J. D. M.—Prove that

$$C_1 - \frac{C_2}{2} + \frac{C_3}{3} - \ldots + (-1)^{n+1}\frac{Cn}{n} = 1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{n}.$$

Let $d_1, d_2, d_3, \ldots d_n$ represent the first differences of the series

$$1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \tfrac{1}{n};$$

$$d_1 = -\tfrac{1}{2};$$

$$d_2 = \frac{1.2}{1.2.3} = \tfrac{1}{3};$$

$$d_3 = -\frac{1.2.3}{1.2.3.4} = -\tfrac{1}{4};$$

&c., &c.

$$d_{n-1} = (-1)^{n+1}\frac{1.2.3\ldots(n-1)}{1.2.3\ldots n} = (-1)^{n+1}\frac{1}{n}.$$

The $(n+1)$th term of series

$$0,\ 1,\ (1+\tfrac{1}{2}),\ (1+\tfrac{1}{2}+\tfrac{1}{3}),\ldots\left(1+\tfrac{1}{2}+\tfrac{1}{3}+\ldots+\frac{1}{n}\right)$$

is the sum of $1, \tfrac{1}{2}, \tfrac{1}{3}, \ldots \tfrac{1}{n}$

The first order of differences of

$$0,\ 1,\ (1+\tfrac{1}{2}),\ (1+\tfrac{1}{2}+\tfrac{1}{3}),\ldots\left(1+\tfrac{1}{2}+\tfrac{1}{3}+\ldots+\frac{1}{n}\right)$$

is the series $1, \tfrac{1}{2}, \tfrac{1}{3}, \ldots \tfrac{1}{n}$;

If $D_1, D_2, D_3, \ldots D_n$ represent the first differences of the above series,

$$\therefore D_2 = d_1,\ D_3 = d_2, \ldots D_n = d_{n-1};$$

The $(n+1)$th term of the above series, putting a for first term

$$= a + D_1 n + D_2\frac{n(n-1)}{1.2} + D_3\frac{n(n-1)(n-2)}{1.2.3} + \ldots + D_{n-1}n + Dn$$

(But $a = 0$, $D_1 = 1$, $D_2 = d_1 = -\tfrac{1}{2}$, $D_3 = d_2 = \tfrac{1}{3}, \ldots$ $D_n = d_{n-1} = (-1)^{n+1}\frac{1}{n}$)

$$= n - \frac{n(n-1)}{1.2}\times\tfrac{1}{2} + \frac{n(n-1)(n-2)}{1.2.3}\times\tfrac{1}{3} - \ldots + (-1)^{n+1}\frac{1}{n}$$

$$= C_1 - C_2\times\tfrac{1}{2} + C_3\times\tfrac{1}{3} - \ldots + (-1)^{n+1}C_n\times\frac{1}{n};$$

$$\therefore C_1 - \frac{C_2}{2} + \frac{C_3}{3} - \ldots + (-1)^{n+1}\frac{Cn}{n} = 1 + \tfrac{1}{2} + \tfrac{1}{3} + \ldots + \frac{1}{n}.$$

Q. E. D.

2. 4th YEAR P. T.—From each of a number of gold coins a person filed a fifth part, and had passed $\frac{3}{5}$ of them, gaining thereby 52s. 6d., when the rest were seized as light coin, except one with which the man decamped, having lost on the whole $\frac{4}{5}$ as much as he had gained before; how many coins were there at first?

Gain on each coin passed = $\frac{1}{5}$ of its value,
Loss ,, ,, seized = $\frac{4}{5}$,, ;

$$\therefore \left(\frac{2x}{5} - 1\right)\times\tfrac{4}{5} = (1+\tfrac{4}{5})\left(\frac{3x}{5}\times\tfrac{1}{5}\right)$$

$$\frac{4(2x-5)}{25} = \tfrac{9}{5}\times\frac{3x}{25} = \frac{7x}{25}$$

$$8x - 20 = 7x$$

$$8x - 7x = 20$$

$$\therefore x = 20.$$

$\therefore$ No. of coins = 20. Ans.

3. FELIX.—Given $\frac{a^2x}{1-a\sqrt{x}} = \frac{a}{\sqrt{x}} + \frac{1}{1-a\sqrt{x}}$, to find value of x.

$$\frac{a^2x}{1-a\sqrt{x}} = \frac{a}{\sqrt{x}} + \frac{1}{1-a\sqrt{x}}$$

$$-\frac{a}{\sqrt{x}} = \frac{1-a^2x}{1-a\sqrt{x}} = \frac{(1+a\sqrt{x})(1-a\sqrt{x})}{1-a\sqrt{x}} = 1 + a\sqrt{x}$$

$$-a = \sqrt{x} + ax$$

$$ax + \sqrt{x} = -a$$

$$x + \frac{\sqrt{x}}{a} = -1$$

$$x + \frac{\sqrt{x}}{a} + \left(\frac{1}{2a}\right)^2 = \frac{1}{4a^2} - 1 = \frac{1-4a^2}{4a^2}$$

$$\sqrt{x} + \frac{1}{2a} = \frac{\pm\sqrt{1-4a^2}}{2a}$$

$$\sqrt{x} = \frac{\pm\sqrt{1-4a^2}-1}{2a}$$

$$\therefore x = \left\{\frac{\pm\sqrt{1-4a^2}-1}{2a}\right\}^2.$$

Or, $x = \dfrac{1-4a^2 \pm 2\sqrt{1-4a^2}+1}{4a^2} = \dfrac{2-4a^2 \pm 2\sqrt{1-4a^2}}{4a^2} = \dfrac{(1-2a^2)\pm\sqrt{1-4a^2}}{2a^2}$.

4. W. MASTERS.—A banker gives £410 15s. cash for a bill; his profit is 1s. 4d. Find the true discount on the bill.

Present worth of bill = £410 15s. + 1s. 4d.
= £410 16s. 4d.;

Discount = Interest on Present Worth,

And, Difference between Discount and Interest = Interest on Discount.

Let x = Interest on £1 in fraction of a pound for the given time at the given rate,

Then, $410\frac{4}{5} \times x \times x = \frac{1}{157}$

$$24649x^2 = 4$$
$$157x = 2$$
$$\therefore x = \frac{2}{157}.$$

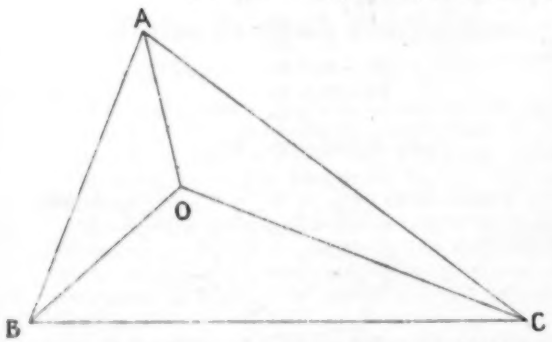
$$\therefore \text{Discount} = \left(410\tfrac{4}{5} \times \tfrac{2}{157}\right)£$$
$$= \left(\frac{24649}{60} \times \frac{2}{157}\right)£$$
$$= \tfrac{1}{30}£$$
$$= £5\ 4s.\ 8d.$$ Ans.

Trigonometry.

1. WILTSHIRE YOKEL.—If a point be taken within a triangle so that the sides subtend equal angles at it, and α, β, γ be the distances of this point from the angular points of the triangle, show that

$$a^2 + b^2 + c^2 = 2(\alpha^2 + \beta^2 + \gamma^2) + \frac{4 \text{ area of triangle}}{\sqrt{3}}.$$

(*Todhunter's* 'Trigonometry for Beginners.')



Let ABC denote the triangle, and O the point within it.

Then the angles AOB, BOC, COA are all equal, so that each is 120°.

Let OA = α, OB = β, OC = γ.

Then, $BC^2 = BO^2 + CO^2 - 2BO \cdot CO \cos 120°$,

That is, $a^2 = \beta^2 + \gamma^2 + \beta\gamma$;

Similarly, $b^2 = \gamma^2 + \alpha^2 + \gamma\alpha$,

And, $c^2 = \alpha^2 + \beta^2 + \alpha\beta$;

∴ By addition,

$$a^2 + b^2 + c^2 = 2(\alpha^2 + \beta^2 + \gamma^2) + \alpha\beta + \beta\gamma + \gamma\alpha.$$

Now, area of triangle BOC = $\frac{1}{2}\beta\gamma \sin 120°$

$$= \frac{\beta\gamma\sqrt{3}}{4};$$

Similarly, area of triangle COA = $\frac{\gamma\alpha\sqrt{3}}{4}$,

And, " " AOB = $\frac{\alpha\beta\sqrt{3}}{4}$;

Hence, by addition,

$$\text{Area of triangle ABC} = (\alpha\beta + \beta\gamma + \gamma\alpha)\frac{\sqrt{3}}{4},$$

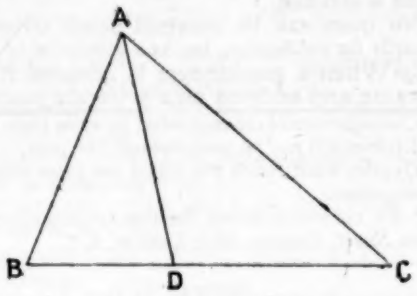
$$\therefore \alpha\beta + \beta\gamma + \gamma\alpha = \frac{4}{\sqrt{3}} \text{area of triangle ABC.}$$

Wherefore,

$$a^2 + b^2 + c^2 = 2(\alpha^2 + \beta^2 + \gamma^2) + \frac{4 \text{ area of triangle}}{\sqrt{3}}.$$

2. WILTSHIRE YOKEL.—Show that the length of the straight line drawn to bisect the angle A of a triangle, and terminated by the opposite side is $\frac{2bc \cos \frac{1}{2}A}{b + c}$.

(*Todhunter's* 'Trigonometry for Beginners.')



In the triangle ABC let AD bisect the angle BAC.

Then, area of triangle BAD = $\frac{1}{2}$ BA . AD sin BAD
= $\frac{1}{2}c$. AD sin $\frac{1}{2}$A;

Similarly, area of triangle CAD = $\frac{1}{2}b$. AD sin $\frac{1}{2}$A;

Hence, by addition,

$$\tfrac{1}{2}\text{AD}(b + c)\sin\tfrac{1}{2}\text{A} = \text{area of triangle ABC}$$
$$= \tfrac{1}{2}bc \sin \text{A}$$
$$= bc \sin \tfrac{1}{2}\text{A} \cos \tfrac{1}{2}\text{A},$$
$$\therefore \text{AD} = \frac{2bc \cos \frac{1}{2}\text{A}}{b + c}.$$

Note.—Please refer to Rule 1 of Query Column.

Arithmetic.

1. ANNIE LINDSAY.—Two houses are built by two sets of men in days which are in the ratio of 20 : 27. If each set had worked the same number of hours per day, the ratio would have been 2 : 3. If each had been built by the other set of men working as they actually did the ratio would have been 108 : 125. If 30 men were employed on the first who worked 9 hours a day, how many were employed on the second and how many hours a day did they work? (*Marlborough Arithmetic.*)

(1) Time for 1st house : Time for 2nd house
:: No. of men in 1st set × No. of hours per day × 20
: No. of men in 2nd set × No. of hours per day × 27.

(2) Time for 1st house : Time for 2nd house
:: Number of men in 1st set × 2
: Number of men in 2nd set × 3.

(3) Time for 1st house : Time for 2nd house
:: No. of men in 2nd set × No. of hours per day × 108
: No. of men in 1st set × No. of hours per day × 125.

Let M stand for number of men in 2nd set, and H for number of hours they work per day.

(α) No. of men in 1st set × No. of hours per day × 20
: No. of men in 2nd set × No. of hours per day × 27
:: No. of men in 1st set × 2
: No. of men in 2nd set × 3;

$$\therefore 30 \times 9 \times \tfrac{20}{10} : \text{M} \times \text{H} \times \tfrac{27}{3} :: 30 \times 2 : \text{M} \times 3$$
$$10\text{M} = \text{M} \times \text{H}$$
$$\therefore \text{H} = 10.$$

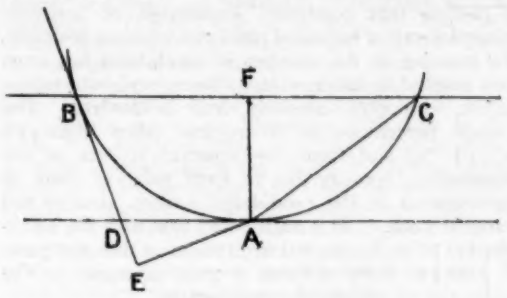
(β) No. of men in 1st set × 2 : No. of men in 2nd set × 3
:: No. of men in 2nd set × No. of hours per day × 108
: No. of men in 1st set × No. of hours per day × 125;

$$\therefore 30 \times 2 : \text{M} \times 3 :: \text{M} \times \tfrac{9}{6} \times \tfrac{108}{125} : 30 \times 9 \times \tfrac{125}{5}$$
$$\text{M} \times \text{M} = 625$$
$$\therefore \text{M} = \sqrt{625}$$
$$= 25.$$

$$\therefore \text{Number of men in 2nd set} = 25$$
$$\text{Number of hours per day} = 10.$$

Geometry.

1. A STUDENT.—A series of circles touch a fixed straight line at a fixed point; show that the tangents at the points where they cut a parallel fixed straight line all touch a fixed circle? (*Todhunter.*)



Let A be the fixed point in the fixed straight line.

Let a circle which touches the fixed straight line at A cut the fixed parallel straight line at B and C.

Draw a tangent to this circle at B, and let it meet the fixed straight line at D.

Draw AE perpendicular to BD produced, and AF perpendicular to BC. Join AB, AC.

Proof.—$\angle$ DBA = $\angle$ ACB, (III. 32.)
And $\angle$ ABC = $\angle$ ACB, (I. 4.)
because AF passes through the centre (III. 19), and consequenily bisects BC (III.-3).

$$\therefore \angle \text{DBA} = \angle \text{ABC}. \quad \text{(Ax. 1.)}$$

Hence in the two triangles ABE, ABF,
The side AB is common,

$$\angle \text{ABE} = \angle \text{DBA},$$
$$\text{And } \angle \text{AEB} = \angle \text{AFB}, \text{ (Ax. 11.)}$$
$$\therefore \text{AE} = \text{AF}. \quad \text{(I. 26.)}$$

Hence the straight line through B will touch at E the circle described from A as centre with radius equal to the fixed length AF.

Similarly the tangent at C to the circle will touch the same fixed circle.

In the same manner it can be demonstrated that the tangents to any other circle, which touches the fixed straight line at A, at the points where it cuts the fixed parallel straight line, will touch the same fixed circle.

Q. E. D.

General.

1. MECHANIC.—One pound of lead (S.G. 11) is tied to a piece of cork (S.G. ·22), and when they are put in water, one-half of the cork is immersed.

How much does the cork weigh? (*Blackie's* 'Mechanics.')

$$\frac{\text{Weight of lead}}{11} + \frac{\frac{1}{2}\text{ weight of cork}}{\cdot 22} = \text{Weight of water displaced;}$$

If W represent weight of cork in lbs.,

Then, $\frac{1 \text{ lb.}}{11} + \frac{\frac{1}{2}\text{ W lbs.}}{\cdot 22} = (1 + \text{W}) \text{ lbs.}$

$$\frac{1}{11} + \frac{25\,\text{W}}{11} = 1 + \text{W}$$
$$1 + 25\,\text{W} = 11 + 11\,\text{W}$$
$$25\,\text{W} - 11\,\text{W} = 11 - 1$$
$$14\,\text{W} = 10$$
$$\therefore \text{W} = \tfrac{5}{7}.$$
$$\therefore \text{Weight of cork} = \tfrac{5}{7} \text{ lb.}$$

2. EIGHTEEN.—We must compliment you upon your excellent writing. Your book list is very good. Wrigley's 'Mathematical Problems' is a capital book. You can get a secondhand copy for a few shillings. Perhaps the best recent book on Mechanism is Professor Kennedy's 'Principles of Mechanism,' Macmillan and Co. If you want to study Conic Sections analytically, get C. Smith's 'Conic Sections,' Macmillan, 7s. 6d.

3. PLYMOUTH.—Have you read the new regulations? If so you will have noticed the importance attached to blackboard. Study that branch of the work and apply for permission to take that subject at a training college.

4. NANT.—The book you name is a good one. But you must remember that the enunciations given at Christmas will be nearly in the words used by Potts and Todhunter. Hence, if you are not familiar with them, you may not recognise them, and if you fail to identify the propositions you cannot prove them. As to symbols, refer to the subject of Euclid in this magazine for this month, page 333. You must observe the instructions on the paper given you.

5. MATER.—Any stage except the 1st and 2nd. Choose the one you prefer, and we will then recommend books.

6. SEE WHY.—We suppose you mean the subjects in Latin and Greek if you take it. You do not expect us to print the Syllabus. For January, 1889, the Latin subject is 'Sallust's Conspiracy of Catiline.' For June, 1889, the Latin subject is Vergil's Æneid, Books I. and II. For January, 1889, the Greek subject is Homer's Iliad, Book VI. For June, 1889, the Greek subject is Cyropædia, Book V. For a detailed Syllabus, write to the Registrar, Burlington House, Piccadilly, W.

7. CHICK.—We believe you can. Make application and enquire.

8. CARIAD.—The large hand is the worst. The curves badly shaped, down straight strokes uneven, and here and there bent. The slant is uniform and correct. Writing shows promise. 70 per cent. Small hand is bold and legible. It only lacks smoothness, elegance. Try good ink and a suitable pen. 85 per cent.

9. W.R.S.—Undoubtedly the best books for your purpose are C. Smith's 'Conic Sections,' Macmillan, 7s. 6d., and Williamson's 'Differential Calculus,' Longman and Co., 10s. 6d. They may seem hard at first, but they are quite within your capacity. The remainder will be given next month.

Science Notes.

THE Duke of Argyll in a letter to *Nature* has called attention to what are called functionless organs. Organic Nature is, he says, full of structures which are either wholly or partly functionless. Sometimes they are called aborted, sometimes degenerated, sometimes rudimentary, sometimes representative. But under whatever name the Darwinian philosophy almost invariably explains them as structures or parts of structures which must have once been useful and have become functionless by atrophy or disuse; they are interpreted as relics of a past in which they were useful, never as utilities which are yet to be. I have often thought, says the duke, that if the doctrine of development be true functionless organs must be, as often as not, the germs of potential use and not necessarily at all the remains of past actual use, organs in the process of being built up for the discharge of a very definite and peculiar function, a function for which they are not yet fit or but very imperfectly fitted. Such a view if true would not tell against development or evolution, but it would tell and tell fatally against the element of fortuity which is inseparable from the idea of natural selection.

In reply to the duke Professor E. Ray Lankester states as a result of the progress of the doctrine of evolution for a quarter of a century that the origin of species by natural selection in the struggle for existence is everywhere being more completely demonstrated by reasoning and observation. Mr J. T. Hurst asks if we are to expect that the coccyx is prophetic of a tail to the human family or that the time is approaching when the rudimentary covering of hair on the human body will develop into a warm coat similar to that of the bear or the beaver.

THE great volcanic eruption in Krakataō in 1883 can hardly be yet forgotten. Before the eruption the island was covered with luxuriant vegetation, all trace of which was obliterated by that alarming event. Dr. M. Tent has just published an account of his visit to the island. It is pretty certain that all vegetable life must have been destroyed in the island. Most surprising therefore is it to learn that at the present time a very considerable vegetation has sprung up, eleven species of ferns were collected. Examination showed that fresh water Algæ had covered the pumice stone and cinders and thus prepared the ground for the ferns much as they prepare a soil in which flowering plants will germinate and thrive. Beside ferns there were found many plants which are known to appear very soon on recently raised coral islands. The rapidity with which the vegetable life of the island has been renewed is most striking and instructive.

***

FROM time to time testimony continues to be borne to the increasing importance of the study of physics. Sometimes it is on account of the educational value of it, sometimes it is because it is essential to the correct understanding of many other sciences. The Science and Art Department has only recently decided to issue a new and more general syllabus for elementary students. Professor Gardiner in an address to the British Medical Association gave utterance to a remarkably strong opinion as to the value of physics to the medical practitioner. We quote an extract from his speech, 'When we consider,' he said, 'how completely modern science has demonstrated the subordination of living bodies and physiological processes, not to a wholly detatched set of laws termed vital, but to all the most elementary laws of matter; and further the correlation of all the physical forces throughout the universe, so that the living body and its environment act and react upon each other throughout infinite space and time, it will be readily admitted, I think, that some kind of systematised instruction in physics, and not a mere elementary examination in mechanics, should be an essential part of an education with a view to the medical profession. And when we further consider that most of the great advances in medical diagnoses in the present day through the stethoscope, microscope, laryngoscope, ophthalmoscope, sphygmograph, and electrcity as applied to muscle and nerve, involve applications of pure physics which are neither remote from practice, nor yet to be easily mastered by the beginner, and that in the case of electricity and other physical reagents, even heat and cold, we are every day extending the domain of these sciences in therapeutics and still more perhaps in preventive medicine and sanitary science, their claim for an extended recognition in teaching seems to be enormously enhanced. I am persuaded that in a very few years the physical laboratory will become an absolutely essential preliminary step in the education of the physician of the future, and that those who have not undergone this training will be hopelessly distanced in the race."

***

SIR Philip Magnus reports that in the present year there has been a large increase in the total number of candidates examined for the certificates in technology. In 1887, 5508 were examined, of whom 3090 passed, in 1888, 6166 were examined, of whom 3510 passed. Examinations have been held this year in 49 subjects. The subjects in which the least number of candidates presented themselves are those connected with the chemical industries, and the examiners in these subjects generally remark that few of the candidates are found to possess that combined knowledge of scientific principles and of technical processes which is desirable. The increase in the number of candidates has been most marked in cloth, cotton, linen, and jute manufacture, carpentry, masonry, and brickwork. The average percentage of failure has fallen from 43·8 to 43·1 %, and from the separate reports of the examiners it appears that in most subjects there is improvement in the candidates' written answers and practical work. It is anticipated that with the establishment of technological institutions in different parts of London there will be a great increase in the number of candidates for examination.

Publications Reviewed.

Royal Standard Readers. The Boy makes the Man. For Standard VI. London: T. Nelson and Sons.

This volume forms a fitting conclusion to Messrs. Nelson's latest series of reading books for the Standards. Its contents consist largely of biographical sketches, illustrating the boyhood and manhood of eminent men, such as Nelson, Livingstone, Lincoln, Garfield, Dr. Johnson, and West. Moral teaching is thus given in its most attractive form—the exhibition of examples. Interspersed with the narrative lessons are others consisting of striking quotations from great writers, and a selection of spirited poems and songs. Helps to understand the lessons and exercises in word-making and grammar are given in the lavish manner characteristic of similar works from the same publishers.

The Encyclopædia of Education. (Parts I. to VII.) London: Swan, Sonnenschein, Lowry, and Co.

With what satisfaction and hope does the teacher of to-day take up a work like this. When called upon to pronounce with authority upon any one of the modern and manifold developments of the art he professes he will now, he trusts, be able to arm himself with a fulness and accuracy of information worthy his position, and the knowledge for which the world gives him credit. Alas for human aspirations! we do not hesitate to say that in this case many of the teacher's hopes at least will be doomed to disappointment.

The articles on 'Health in School' are clever, they are up to date, and are applied to the conditions of school life in such a way as to render them of great practical value; those on the various laws of mental science are extremely well done from their purely psychological side, but surely some serious attempt should be made at their application to the actual life and work of the school. In a comparatively new science there is need of abundance of examples; here, however, whilst the generalities of mental science are admirably stated, there is little or no attempt to bring them into living and organic connection with the methods and discipline of the school. If the work be tested by the light and guidance it yields upon the newest development of English education—that of manual instruction—it falls far short of expectancy. An article of little more than a page in extent is devoted to this subject, and is for the most part culled from American reports; the only references to work of this kind in England are to the workshops at Clifton, Oxford, Cambridge,

and Uppingham, and these are dismissed in half-a-dozen lines. No mention is made of the institution at Bradford, with its thousand students, and that in connection with the City Guilds, of the work long conducted at King's College, Dulwich and Finsbury Colleges, and the Polytechnic in London, at Newcastle, Nottingham, and Birmingham. The fact that more than 200 teachers of various grades attended lectures and took part in the demonstration at one London centre during the past year, and that the work has assumed a tangible form under the direction of the London School Board, should find place in any account of manual instruction in England. The article reminds us of some educationists in England who, as soon as the subject of teaching is mentioned, air their knowledge of education abroad in order to hide their ignorance of what is being done at home. We notice frequently that the relative importance of topics is not nicely balanced; for example, the article on 'Schools of the Middle Ages' takes up more than three times the space allowed the article on 'Middle Class Schools;' again, the article on Mnemonics is longer than the article on Memory. The works for further reference mentioned under many of the articles will be found of great practical service to teachers of all grades.

In the later issues we find a short and reliable account of the life and work of Pestalozzi, an article on 'Punctuation,' twice the length of the article following on 'Punishment,' and a capital account (unfinished) of the 'Renaissance in its relation to Education.' The article on 'Reading' is remarkable for the abundance of its quotations from the writings of educationists from Locke to Bain, and the reader is left in the midst of doctrines and theories of the most conflicting kind with the slightest of guidance from the author. We could wish the notion of M. Renan that Christ was taught on the *Simultaneous System* had been omitted. It serves no purpose as an authoritative opinion on the teaching of reading, and its introduction is flippant if not irreverent.

First Elements of Experimental Geometry. By Paul Bert. Translated from the French. London: Cassell and Company, Limited.

Every teacher under the Code is acquainted with the note at the foot of Schedule IV. which says, 'it is intended that the instruction in the science subjects shall be given mainly by experiment and illustration.' And almost every teacher knows that it is useless in the race for percentages to attempt to prepare for an examination through these means either solely or chiefly. We have no doubt many teachers also have again and again thought how little application could be made of the mass of definitions and tricks taught for a pass in more than one of the science subjects. Great outcry has of late been made respecting technical education, and its commencement in our elementary schools. So long as it remains an inducement to pass an examination by the payment of so much per pass, so long will bastard methods of instruction be continued. Once, however, assure managers and teachers that they will not have to suffer pecuniarily by the adoption of good methods, and those methods will at once come into use. It is generally admitted that drawing, and especially geometry, is a valuable aid to practical knowledge in after life. But the learning of a mass of definitions and the ability to draw figures is generally the sum of all the knowledge most of our boys get. Here, however, is a book before us which gives definitions only as new figures are introduced, and which makes a practical application of every fact which it is found necessary to teach. In a series of forty-four short lessons, the pupil by remarkably easy stages is made acquainted with lines, surfaces, solids and angles, and the methods of calculating lengths, areas and contents, besides learning how to draw geometrical figures and plans, and how to apply this knowledge to surveying. It is certain that a new era would dawn upon our educational world if such books as those of Paul Bert were generally used in our schools. We are quite sure that a pupil who had mastered this little book would be infinitely better prepared for service as a mechanic than nine-tenths of those who go through the usual lessons in geometrical drawing in our schools. The translator has done his work thoroughly well, while the printers, by good type, chaste binding, and the use of the original illustrations, have done their best in supplying a thoroughly practical manual. A series of questions on each lesson adds largely to the value of the book.

Our Animal Friends. London and Edinburgh: W. and R. Chambers.

Messrs. Chambers have added a handsome volume with the above title to their list of gift books. It abounds with stories of the horse, dog, cat, and elephant. These are arranged to show the various characteristics of the animals, and the qualities which they develop. Thus we have stories describing the personal attachment, fidelity, educability, and sagacity of the dog; the affection, courage, memory, and intelligence of the cat; the courage, revenge, obstinacy, and docility of the horse; and the employment, obedience, gratitude, revenge, &c., of the elephant. The book is neatly got up, well illustrated, and its perusal must produce a good effect on the mind of the reader, kindness to animals being inculcated in almost every descriptive page.

Horn's (a) Geography of the British Empire; (b) Geography of the Five Continents; (c) Grammar and Geography for Third Standard. Manchester: John Heywood.

These are cheap and generally accurate little summaries of the geography of the various parts of the world, suitable for memory work for the various standards. The two marked (a) and (b) may be had together in cloth. Standard III. has lessons in Grammar as well as Geography.

(a) The Standard Arithmetic. By Ebenezer L. Jones.

(b) The New Graded Arithmetic. By C. H. Wykes. Manchester: John Heywood.

A new and revised edition of (a) is now being published. Part II., under notice, contains a large collection of questions on every kind of British weights and measures, necessary and unnecessary to be taught in our schools.

Part VI. of (b) is intended for Standard VI., and contains nearly nine hundred graduated questions for one penny.

Donald's Hamper. By A. J. Foxwell and C. H. Lewis.

Prairie Life. By A. J. Foxwell. London: J. Curwen and Sons.

These are two little Operettas or Cantatas for school use. The music is easy and cheerful, and may be attempted in any schools where the children sing in two or more parts.

New Songs for English Schools. By H. Kreuz. London: G. Gill and Sons.

This little work contains 25 capital songs in two and three parts; and, being printed in both notations, it is admirably suited to the wants of teachers and the requirements of the New Code.

The Infant Action Song and Recitation Book By Mrs. Hibbert. London: J. Marshall and Co.

We are pleased to call the attention of the readers of the *Practical Teacher* to Part IV. of this little work, which fully sustains and supplements the excellent practical features of the preceding parts.

A misprint on page 108, last score, 3rd bar, in the tenor, gives rise to some ugly consecutives.

Arithmetic Drill Sheets for Infants. London and Edinburgh: T. Nelson and Sons.

A very serviceable addition to the apparatus of an Infant School. Five large sheets of tough parchment paper are mounted on a roller and printed in two colours, the first with names, numbers and dots of the ten numerals; the others—two with little exercises in addition up to tens, and the other with subtraction sums of the same kind, one of each having answers and the other being without. They will save time, and will give the familiarity with these exercises necessary to ensure rapid and correct mental work. They are executed in the best style of this well-known Edinburgh House, and the price is reasonable.

Musical Terms; a short Dictionary. By A. Kennedy, M.A., &c. London: J. Curwen and Sons.

This is a cheap and convenient Dictionary, arranged somewhat in the style of Stainer and Barrett's 'Musical Terms' in Novello's Series of Primers. The addition of the pronunciation of all difficult words renders this little book extremely valuable to musical students, and especially to those who have not the opportunity of studying more expensive and elaborate works.

Royal Star Arithmethic Cards. Seven Packets. Standards I.—VII. Edinburgh: T. Nelson and Sons.

These packets each contain thirty-six cards of Inspector's Test Sums, with six mental arithmetic sums printed on the opposite side of each card. The sums, both tests and mental, are practical, and the answers may be relied upon. The cards are of thin, but tough and durable, parchment paper.

HIGH COURT OF JUSTICE.

CHANCERY DIVISION.

(Before Mr. Justice NORTH.)

HUGHES *v.* CHAPMAN AND HALL, LIMITED.

On Friday, July 27th, Mr. Cookson-Crackenthorpe, Q.C.—with whom was Mr. G. Benson Clough—moved on behalf of Mr. Joseph Hughes, Pilgrim Street, Ludgate Hill, for an interim injunction to restrain the defendants, Messrs. Chapman & Hall, Limited, publishers, of Henrietta Street, Covent Garden, from issuing any further copies of a work entitled 'Mechanical and Experimental Chemistry,' by Dr. Edward B. Aveling. This book was neither more nor less than a pirated edition (errors included) of a work issued by the plaintiff in 1886, entitled *Dr. Aveling's Chemistry of the Non-Metallics.*

The defendants on having the fact drawn to their attention were willing to treat the motion as the trial of the action, and submit to a perpetual injunction. Upon the plaintiff waiving his claim to damages they also undertook to pay all costs, including costs as between solicitor and client.

Mr. Justice North accordingly granted a perpetual injunction in the terms asked.

Owing to pressure on our space we are compelled to hold over until next issue the following papers:—'Model Essay,' 'Practical Needlework in Elementary Schools,' the 'School Song,' as well as several Reviews.

A. G. DAWSON'S SCHOOL SERIES.

The Volume for Standard I. JUST READY.

STANDARD TEACHING HELPS.

Illustrated by Model Lessons, for Boys, Girls, and Mixed Schools.

By H. MAJOR, B.A., B.Sc., INSPECTOR OF BOARD SCHOOLS, LEICESTER.

PRICE 2s. 6d.

This Treatise differs from any other yet published on School Management, in being written entirely and solely for the Class Teacher of Standard I., who will find within the covers every subject dealt with that he has to take up in the course of the School year.

OTHER VOLUMES TO FOLLOW.

The Pupil Teacher's Handbook of Teaching, Organisation, and Discipline.

By A. PARK, F.R.G.S., F.E.I.S., &c. PRICE NINEPENCE.

Spelling for Standard I. Being 1,200 easy and familiar words for Class Teaching and Examination. Compiled by HERBERT WILLS, Author of 'Synopsis of English History,' 'Synopsis of Scotch History,' &c. *Price One Penny.*

The Words are the result of twelve years' careful search, and may be relied on to more than cover the Spelling Requirements for the First Standard.

1,000 EVERY-DAY WORDS COMMONLY MIS-SPELT.

Selected from Leading Articles of the 'Times,' 'Standard,' 'Telegraph,' 'Daily News,' 'Morning Post,'

PRICE ONE PENNY.

SECOND SERIES OF 1,000 EVERY-DAY WORDS,

COMMONLY MIS-SPELT, CONTAINING MORE DIFFICULT WORDS. **PRICE ONE PENNY.**

Complete Catalogue of Educational Works on application.

A. G. DAWSON, 14, IVY LANE, PATERNOSTER ROW, LONDON, E.C.

GEORGE GILL & SONS' RECENT PUBLICATIONS.

All Teachers should see the following before ordering new books.

THE 'WHITEHALL' LITERARY READERS.

The only Standard Readers specially compiled to suit the latest requirements of the Code. They are not old reading books re-dressed, but are entirely new.

STANDARD I. ... ... 9d. | STANDARD III. ... ... 1s. 0d.
STANDARD II. ... ... 10d. | STANDARD IV. ... ... 1s. 3d.
STANDARD V. (Voyages and Travels; comprising scenes from the history of Exploration.) The most interesting reader published ... 1s. 4d.
STANDARDS VI. & VII. (Extracts from the Works of Standard Authors.) ... ... 1s. 6d.

Also Primers Part 1, 2, and 3; each 3d. Cloth.

THE 'ALBERT' GEOGRAPHICAL READERS.

The most interesting, the most readable, and the most beautiful Geographical Readers yet produced.

STANDARD I. ... ... 9d. | STANDARD IV. ... ... 1s. 0d.
STANDARD II. ... ... 9d. | STANDARD V. ... ... 1s. 4d.
STANDARD III. ... ... 1s. 0d. | STANDARD VI. ... ... 1s. 6d.
STANDARD VII. ... ... 1s. 6d.

THE 'WHITEHALL' DRAWING COPY BOOKS.

Specially prepared in accordance with the New Schedule. The following numbers are now ready :—

FREEHAND DRAWING.		MODEL DRAWING.	
STANDARDS I. & II.	No. 2. ... 2d.	STANDARD IV.	No. 4. ... 2d.
STANDARD III.	No. 2. ... 2d.	STANDARD V.	No. 7. ... 2d.
STANDARD IV.	No. 3. ... 2d.	STANDARD VI.	No. 10. ... 2d.
STANDARD V.	No. 6. ... 2d.	GEOMETRY.	
STANDARD VI.	No. 9. ... 2d.	STANDARD IV.	No. 5. 2d.
		STANDARD V.	No. 8... 2d.
		STANDARD VI.	Nos. 11 & 12... 2d.
		STANDARD VII.	Nos. 14 & 15... 2d.

GILL'S PRACTICAL GEOMETRY FOR THE STANDARDS.

These little Text Books contain all that is necessary for this subject. Standard IV.; VI., Plane; VI., Solid; VII., Plane; VII., Solid. 2d. each. Standard V., 1d.

EVERY TEACHER SHOULD SEE

GILL'S 'VICTORIA JUBILEE' COPY BOOKS.

NOS. 1 TO 14 NOW READY. *TWOPENCE EACH.*

Beautifully printed, in coloured wrapper, on excellent paper, and the only twopenny Copy Book ever issued with 32 pages. Nos. 1 and 2 are for Infants. Samples Free.

GEORGE GILL & SONS, MINERVA HOUSE, WARWICK LANE, E.C.

DRAWING INSTRUMENTS FOR SCHOOL USE.

W. H. HARLING, 40, Hatton Garden, London, E.C.
Patentee of NEW CONE FITTING INSTRUMENTS.
FORTY YEARS PRACTICAL MANUFACTURER.
ILLUSTRATED CATALOGUES POST FREE.

Post 8vo. Strongly bound. Price 7s.

CAREY'S 'GRADUS AD PARNASSUM.'

With the English Meanings. Recently Revised, Corrected, and Augmented by a member of the University of Cambridge.

London: Published by the Stationers' Company, Stationers' Hall, Ludgate Hill.

SECOND EDITION, 136 pp.

THE SHILLING GEOGRAPHY.

By Dr. CHARLES MORRISON, M.A., F.R.G.S.

'This book is very full of a valuable selection of facts. It is an accurate and well arranged epitome of general geography.'—*Schoolmaster.*

'A bright feature of the book is the introduction of sea trips round the coasts of the British Isles, and railway trips from the chief centres to various towns and places of interest.'—*Educational Times.*

ALSO, BY THE SAME AUTHOR,

THE HISTORICAL SCHOOL GEOGRAPHY.

FIFTH EDITION, 368 pp. 3s. 6d.

'One of the most comprehensive combinations of Geographical knowledge that has fallen into our hands for some time.'—*Irish Teacher's Journal.*

'The Author says "his aim has been to produce an instructive, interesting, and readable work." He has most certainly succeeded.'—*Journal of Education.*

SPECIMENS SENT TO PRINCIPALS BY THE AUTHOR, 32, ABERCROMBY PLACE, EDINBURGH, ON RECEIPT OF 6 OR 21 STAMPS RESPECTIVELY.

LONDON UNIVERSITY. Orosian Geography, for Students of Anglo-Saxon, with Maps and Translation of the Voyages of Ohthere and Wulfstan, by JAMES MCCUBBIN and D. T. HOLMES. Crown 8vo., stiff boards, cloth back, price 2s.

'Am convinced that it is the result of most careful work, and must prove of much use to those who are studying the subject.'—Professor HENRY CRAIK, LL.D., C.B. Examiner in English Literature to the University of London, and Secretary to the Scotch Education Department, Dover House, Whitehall.

W. & A. K. JOHNSTON,
EDINA WORKS, EASTER ROAD, EDINBURGH;
and 5, WHITE HART ST., WARWICK LANE, LONDON, E.C.

MUSIC TEACHERS OF ALL KINDS using the Old or New Notation in Private or Public Schools, Institutions, Choral Societies, Church Choirs, Temperance Choirs, &c., who have not received J. CURWEN & SONS' Annual Circular, with offer of sample copies of new music at nominal prices, are invited to apply for it. Please give particulars of appointment held, and mention this paper. J. CURWEN & SONS, 8 and 9, Warwick Lane, London, E.C.

EVERY SCHOOLMASTER is naturally anxious to increase his income. Every schoolmaster knows persons who like to finish off their children's education by sending them to a Boarding School. The Principal of a School in the Midlands, who can furnish unexceptionable testimonials, is anxious to increase his connection, and therefore makes the following offer. If you recommend his School to any parents with the result that they send him a Boarder, he will pay you 5 per cent. on the first year's receipts, or on the receipts for the full time the Boarder stays with him, if less than a year. In order that you may see whether you can conscientiously do this, send your name and address to—MAGISTER, 34, Brook Street, Tavistock.

MANCHESTER TRACTS ON EDUCATION.

By JAMES A. NEWBOLD, B.A., Manchester School Board.

TRACT III.—TECHNICAL EDUCATION:

A Two Fold Protest—Educational and Financial.

Heads of Chapters:—Ambiguity of Term—What Technical Instruction cannot do—A Technical Utopia, who shall pay?—Self-help *v.* Rate-aid—The Lesson of German Competition—Educational Philistinism—Professor Huxley on 'Pouring In'—The Work of the Science and Art Department—English *v.* Foreign Clerks.

MANCHESTER AND LONDON: JOHN HEYWOOD. (SIXPENCE.)

EYRE & SPOTTISWOODE'S

MATHEMATICAL

DRAWING INSTRUMENTS,

WATER COLOURS, OIL COLOURS,

And all Drawing Materials suitable for TECHNICAL and ART STUDENTS;

Sets in Boxes, Protractors, Rules, Scales, Ruling Pens, Drawing Boards, Set-Squares, T-Squares, Drawing Pins, Indian Ink, Brushes, Palettes, Pencils, Crayons, &c.

GEOMETRICAL DRAWING MODELS.

Student's Set of 10 Models	10/6
Larger Set for Drawing Class use	42/-
Extra large Set of 17 Models for the New "Drawing Schedule"	100/-

LIBERAL TERMS FOR SCHOOLS.

ILLUSTRATED CATALOGUE sent Post Free on application to

LIBERAL TERMS FOR QUANTITIES.

EYRE & SPOTTISWOODE,

LONDON—Great New St., Fleet St., E.C.

46th YEAR OF PUBLICATION.

REDUCED FAC-SIMILE OF COVER.

NOW READY

AN ENTIRELY NEW EDITION OF

WIGHTMAN'S ARITHMETICAL TABLE BOOK.

ENLARGED to Crown 16mo., and INCREASED from 32 to 40 pages.

Many Million Copies of this valuable little work have been sold.

MAY BE HAD OF

SIMPKIN, MARSHALL & Co.; KENT & Co.; HAMILTON, ADAMS & Co., of the principal Scholastic Agencies,

AND OF THE PUBLISHERS,

WIGHTMAN & Co., 104 & 106, Regency Street; WESTMINSTER, LONDON.

MADE WITH BOILING WATER.

EPPS'S

GRATEFUL—COMFORTING.

COCOA

MADE WITH BOILING MILK

CIVIL SERVICE EXAMINATIONS.

Men Clerks, Age 17—20; **Female Clerks**, 18—20; **Boy Clerks**, 15—17; **Excise Assistants**, 19—22; **Customs**, 19—25; **Telegraphists, Engineer Students, &c.** Rapid Postal preparation of country students on a thoroughly individual system by **J. KEEFE, F.R.G.S., Fellow** and **Examiner** to the **Society** of **Science** (London), &c.

LIVERPOOL.—22, Gt. George St. **MANCHESTER.**—2, Victoria St.

Over 350 Successes. Prospectus Free.

SECOND YEAR CERTIFICATE—DECEMBER.

Highly successful Coaching by Correspondence. No fee unless successful first time. Backward students made to pass. Exceptionally low terms. Addressed envelope for particulars, list of successes, &c.,

GEORGE HENRY SPARROW, Forest Gate, London, E.

N.B.—Acting Teachers who intend taking Papers of the Second Year are invited to communicate at an early date with Mr. SPARROW. The work for Second Year Students having been the speciality for the past seven years, with increasing success each year, there is little fear of failure now. Dull Students are got through safely, and bright ones pushed into First Division.

Tuition by Correspondence

ESTABLISHED 1871.

PUPILS may now be entered for Certificate (1st and 2nd years), Scholarship, Science and Art, Matriculation, A.C.P., and Musical Examinations.

Pupils for Certificate (2nd year men) may take the course for Mathematics only, if desired.

Scripture (for December and July), Languages, Special Subjects, Shorthand, Book-keeping, &c., from 10s. per quarter.

We draw attention to our Courses for Pupil Teachers, Army Schoolmasters and Mistresses, Civil Service Branches, Medical and Legal Preliminary, and to our new department 'Notes and Queries.'

Intending Students and Enquirers (for whatever subject or branch) should write at once to our Office, naming this paper.

Address, JAMES JENNINGS and Co., Tuition by Correspondence Office, Deptford, London.

The 'Practical Teacher' Sale and Exchange Column.

In Good Condition.—London University Calenders for the Years '65, '69, '70, '71, published at 4s. each, post free for 1s. 3d.; Lexicon to 'Sophocles,' by Ellendt, 8vo., 275 pages, post free, 2s.; Greek Testament (1809), interleaved, for 1s.—A. Mitchell, Sutton, Hull.

All Equal to New.—Philip's Comprehensive Atlas (10s. 6d.), 6s.; Philip's Atlas of Physical Geography (5s.), 3s.; Philip's Atlas of British Empire (3s. 6d.), 2s.; Hughes's 'Class Book of Physical Geography' (3s. 6d.), 2s.; Hughes's 'Class Book of Modern Geography' (3s. 6d.), 1s. 6d.; Faunthorpe's 'British Colonies' (2s. 6d.), 1s. 9d.; 'Geography Generalised' (2s.), 1s.; Philip's 'Geography of the Oceans' (2s. 6d.), 1s. 6d.; Piper's 'Arithmetic' (3s. 6d.), 2s.; Martin's 'Plain and Solid Geometry' (3s. 6d.), 1s. 6d.; Martin's 'Euclid' (3s. 6d.), 1s. 6d.; Martin's 'Euclid' (1s. 6d.), 9d.; 'Student's Hume' (7s. 6d.), 3s. 6d.; Chambers' 'History' (2s.), 1s.; Webster's Dictionary, with Walker's Key (12s.), 5s.; Dr. Ogilvie's Dictionary (2s. 6d.), 1s.; Mason's 'English Grammar' (3s. 6d.), 2s. 6d.; Morell's 'Analysis' (2s.), 1s.; 'The Principles and Practice of Teaching,' by A. Park (3s.), 1s. 6d.; Chambers' 'First and Second Latin Course, Key' (1s. 9d.), 1s.; Kerr's 'Algebra, Key' (1s. 9d.), 9d.; Taylor's 'Notes of Lessons' (1s.), 6d.—Wm. Sulston, Crowell, Tetsworth, Oxon.

Good Condition.—University Local Half-hour Papers (1s. 6d.), 10d.; Colenso's 'Arithmetic' (4s. 6d.), 2s.; Galbraith's 'Trigonometry' (2s. 6d.), 1s. 3d.; Todhunter's 'Algebra,' 1s., 'Euclid,' 1s. 3d.; Ross's 'History' (2s. 6d.), 1s. 3d.; Anderson's 'Modern Geography' (1s. 6d.), 9d.: Smith's 'Latin and French Principias,' Part I., 1s. 6d. each; Levien's 'History of Rome' (2s. 6d.), 1s.; Wilkin's 'Latin Delectus' (2s.), 9d.; Philip's Atlas for Beginners (2s. 6d.), 1s.; Bouchier's 'Mensuration' (3s.), 1s. 3d.; 'Introduction to Principia Latina,' Parts I. and II., 1s. 4d. each; 2d. extra for postage.—W. Holmes, Long-street, Easingwold.

BRITISH 29 AU 88